OIL & FAT INDUSTRIES

The Editor's Page

Progress? Yes and No

THE producers, refiners and manufacturers of edible oils and products thereof can look back upon the past year as one of real accomplishment in the stabilization of their industry. The year just past has been the first full year of operation by the members of the Shortening and Oil Division of the Cottonseed Crushers' Association under the Code of Trade Practice and Ethics adopted with the co-operation of the Federal Trade Commission. The consensus of opinion among those whose operations have been affected by this Code is that it has been a real benefit to sellers and buyers of salad oils, cooking oils and shortening.

The cottonseed crushers have taken the big forward step which they had planned for years, in the amalgamation of the Interstate and Texas Associations into the National Cottonseed Products Association. This new Association is moving forward steadily toward the goal of putting methods of purchasing cottonseed and its price on a basis which will permit profits to be made in the oil milling industry, and will eliminate secret rebates and other unsound practices, while still insuring the farmer fair prices for his seed. There always will be, of course, an element of opposition to these fair and open methods of doing business, which opposition will express itself chiefly in shouts about the poor downtrodden farmer, who in fact will be benefited rather than injured by the movement to place the cottonseed crushing industry on a sound business foundation.

We, however cannot help believing that the cottonseed crushers have overlooked a splendid opportunity which is theirs, as outlined in these columns a year ago. The oil milling industry is one with unique problems, but these problems are distinctly similar for millers of all vegetable oils, cottonseed, castor bean, peanut, coconut, soya bean, linseed and others. The cottonseed crushers profess to see a menace to their business in the crushing of imported seeds, but to us, they would seem much more adroit if they would recognize that there is an established demand for the oils produced from certain tropical seeds and nuts and that this demand cannot and will not be filled by cottonseed oil. Every cottonseed oil mill with very slight adaptation can be used for the production of other oils than cottonseed during the season when the primary raw material is not available. How much better, then, it would be for these millers to keep their plants busy on other oilbearing seeds or nuts, domestic or imported, rather than to fight the development of the industries now devoted to crushing such other oil-bearing materials in this country.

When the National Cottonseed Products Association adopts such a policy and welcomes crushers of copra, soya beans, corn germs, linseed and other seeds into its ranks, it will become in fact a National Association.

The Outlook for 1930

FROM various quarters, we hear diametrically opposed opinions hazarded regarding the prospects for business in 1930. There are those who apparently believe that the backwash from the stock market debacle of last October is going to affect business adversely this year. They state that a recession has already taken place which is of sufficient moment to jeopardize the purchasing power of a great part of the American people for certain classes of goods, notably goods in the luxury classes, during the coming year. On the other hand, we hear reports that business is showing no signs of slowing down, that demand is as active as ever, and that plans for 1930 call for expansions in production.

The mixed views on the outlook may be indicative of a mixed trend in general business affairs. Some lines may be better than ever. Others may feel the effects of reduced output in certain groups. That there may be any wide general curtailment of purchasing in all lines seems extremely unlikely. There is no foundation for any such possibility in the present business situation. In fact, outside of a few specialized industries, the outlook generally, as we see it, is unusually good.

As far as products of the oil and fat industries are concerned, 1930 will likely be far above the average of the past ten or so years. Oil and fat products are distinctly not in the luxury class. The food fats, such as margarin,

lard compounds, cooking oils, have become staples which should show a steadily expanding consumption. Any wide reduction in the earning power of the average worker would, if anything, stimulate the purchase of these materials at the expense of the higher priced dairy products.

We believe that when the figures for 1930 are checked up at the end of the year, they will show a continuation of the steady trend in the expansion of oil and fat consumption, particularly in the edible group. In spite of pessimistic grumblings to the contrary, we look forward to a generally good business year in 1930, and in oils and fats, a better year than the one just closed.

Julean Arnold, commercial attache of the U. S. Department of Commerce associated with the U. S. Embassy at Peking, China, gave an interesting talk on wood oil at a special meeting of the Paint, Oil and Varnish Club of Chicago recently.

Mr. Arnold, who is the author of a voluminous handbook on China, is well versed in the problems of American wood oil consumers and it was through his aid that the Department of Commerce established its monthly wood oil cable service from Hankow in the spring of 1923. He has also visited the wood oil developments in and about Gainesville, Fla., on several occasions, and his reports on this situation, circulated among the Chinese, have done much to eliminate adulteration and to stabilize the price.

Mr. Arnold talked interestingly about conditions in China and the opportunities for selling American products there, and discussed the raw materials for American industry which are imported from China.

Foreign Trade Opportunities

The Bureau of Foreign and Domestic Commerce of the Department of Commerce announces that its representatives in all parts of the world have forwarded the following trade inquiries of interest to our readers. In writing the Bureau in reference to any of these inquiries please mention that you saw it in *Oil & Fat Industries*.

No.	Location	Material	Purchase
42857	France	Lard and Margarine	Agency
42902	Germany	Lard and Oils	Agency
42905	Italy	Tallow	Purchase

Archer-Daniels-Midland Elections

S. M. Archer was re-elected president and three new directors were elected at the annual meeting of stockholders and directors of the Archer-Daniels-Midland Co.

The new directors are George H. Prince, St. Paul, president of the First Bank Stock Corporation; Thomas L. Daniels and Philip S. Duff. With their election the board was expanded to twelve members.

At the meeting of the board immediately after the stockholders' meeting, G. A. Archer and Samuel Mairs were re-elected vice-presidents; W. H. Morris was re-elected secretary and L. M. Leffingwell re-elected treasurer.

Prospects for 1930 are "very favorable," Mr. Archer said in his annual report. He also predicted that northwest producers will receive an excellent price for flaxseed next year because of the world shortage of flaxseed during 1929.

A plant for the manufacture of coconut oil has been erected at Tchenghelkeuy Constantinople, Turkey.

The Baltimore office of the Spencer Kellogg & Sons Sales Corporation, which is in charge of Alfred Day, has been moved to a new location on the eighth floor of the American Building, where more space is available.

Canadian Soyabean Products, Inc., is being organized in Ingersoll, Ont., and will establish a soya bean oil plant in the building of the Royal Broom Company in that place.

A suggested rapid method for determining saponification values consists in dissolving 5 grams of oil in 15 cc. of benzyl alcohol, adding phenolphthalein, titrating free acid, adding a measured volume of potassium hydroxide in benzyl alcohol and titrating the excess after boiling five minutes under a reflux condenser. *Chemist-Analyst* 18, No. 5, 7 (1929).

A naphthalenesulfonic acid containing alkyl groups with at least three carbon atoms, for example, isopropylnaphthalenesulfonic acid, is used in soap baths for the purpose of increasing their wetting and penetrating power in dyeing or other processes. U. S. Pat. No. 1,730,037.

Reminiscences of a Well-Known Oil Chemist

Historical Aspects of Vegetable Oil Refining Particularly That of Cottonseed Oil

By DAVID WESSON

I CONSIDER it a great privilege to be able, from my own personal experience, to tell of the changes which have taken place in the cottonseed oil industry during the last forty-five years.

Photo by Alman

David Wesson

I first saw cottonseed oil in the laboratory of the N. K. Fairbank Company in Chicago, where I was employed as a cub chemist to analyze soaps for the new factory which had just started. One day, W. B. Allbright brought in a quart can and poured dark colored oil into a beaker, stuck his finger into the oil, passed it through his mouth, smacked his lips and said: "That is very good oil for the season—this is cottonseed oil—Wesson, see what you can do to get the color out of it." I had hardly heard of cottonseed oil before this time. Nothing had been said about it at the Massachusetts Institute of Technology, from which I had just escaped, so I tried pretty nearly every bottle on the side shelf except the one containing caustic soda, with very little result. After a while, Allbright came back, looked at my puny efforts, filled a metal cup with the oil, poured in some caustic soda, stirred and heated it, and lo and behold, I saw a golden colored oil soon floating above a dark colored mess in the bottom of the cup. Some of the oil was poured into a beaker and stirred with a little strong sulphuric acid and then neutralized with caustic soda, leaving light colored oil. Allbright explained to me that was the kind of oil they wanted to put in some of their compounds.

The refining of cottonseed oil, was a great mystery to the outside world, and it was some time before I was allowed even to go into the factory where it was handled on a large scale. I found out afterwards, that the first oil was brought to the factory in barrels and for secrecy was called #3. The crude oil was known as #3A, yellow oil as 3B and white oil as 3C. The first white oil was made by bleaching with sulphuric acid and then chloride of lime was afterwards used with the addition of sulphuric acid as a bleach. Shortly previous to 1880, a broker in Chicago, Henry Bausher, introduced an Oriental gentleman from Morocco, I believe. He showed how they bleach olive oil by stirring it up with clay and letting it settle. The clay absorbed the color and clarified the oil. An extensive research consisting in testing of clays from all over the country finally resulted in using fullers' earth from England as a bleaching agent. The first use of fullers' earth was rather primitive. The powdered earth was agitated in the kettles with air and allowed to settle. After the clear oil was pumped off, the sludge was at first thrown away. It was then found desirable to boil it up with sulphuric acid in lead lined tanks and press the oil out of it. The oil was very dark colored and was called "plug hat."

A bright young man, named Henry Eckstein, suggested the use of the filter press to separate and clarify the oil instead of settling. With a little press two feet square, he demonstrated his idea, and received a new suit of clothes as a reward. Larger four foot filter presses were next installed, and at first the spent earth was thrown away. It was afterwards found that considerable oil could be recovered by boiling with acid and then pressing. Next, somebody evolved the idea of blowing air through the presses and then steaming them so as to get all the oil possible. This method was in operation forty-five years ago, when I first entered the industry. Needless to say, the oil had a strong flavor of fullers' earth and comparatively small amounts were used in making refined lard. Oleostearine, just coming into use as a by-product of the oleomargarine industry, was used to offset the softening influence of the oil.

At this time, the literature regarding cottonseed oil and the refining thereof was very meager. My only guide books were Allen's

Commercial Analysis, published in 1886, and Schaedler's "Die Technologie Der Fette und Oele," published about the same time. They both told about alkali refining and bleaching, but as usual, with such books, the information was of comparatively little use for factory purposes. In 1886-7, the American Cotton Oil Trust, embracing practically all the cottonseed oil mills and refineries, was organized. In order to secure the best possible methods for producing refined oil, a committee, consisting of C. C. Nichols, of the Union Oil Co., Providence, R. I., Omar T. Joslin, of the American Cotton Oil Company, Cincinnati, Jules Aldige, Jr. of Aldige Co., New Orleans, and the writer, were appointed to visit the various oil refineries of the country, report on the methods found in use, and suggest the best possible procedure.

A few extracts from the report of the committee, which I have before me, may prove interesting.

"1st, The character of the refined oil must depend upon the character of the crude. This being the case we feel we cannot call too much attention to the necessity of using the greatest care in the handling of the seed and the manufacture of the crude oil. We find great variations in the products of the different mills, not only in different localities, but in the same locality. We feel that the producers of crude oil fall far short of understanding the vital importance of making the best crude possible, as from this starting point, we must expect the greatest possible results in maintaining and improving the high reputation of American Refined Cotton Oil for edible purposes.

We cannot too strongly condemn the practice of mixing in small quantities of damaged seed with good, the smallest percentage seriously effecting the quality of the oil when refined."

"2nd, Proper settling of crude—Oil for shipment to refineries at distant points should be thoroughly settled, as the settlings have a tendency to ferment and sour the oil as well as adding to the refining loss."

"It also adds to the expense of cooperage on account of the difficulty of cleaning and loss of material. The question of the disposal of settlings is one worthy of very careful investigation; to work them over through the heaters with the seed or separate them from the oil to be refined like crude."

"Cooperage—We feel that more careful attention should be given to this matter by crude oil mills. Gluing barrels is neither desirable or necessary. Crude petroleum, lubricating oil, varnish, tar, turpentine barrels should not be used for prime crude oil."

Cooperage was an important matter in those days. Almost all oil was shipped in barrels, and all kinds of barrels were used—whisky barrels, kerosene barrels, gasolene barrels, lubricating oil barrels. They came north in box cars. Those which reached New York were handled from the cars to the refineries by lighters, and a lighter-load of barrels of cottonseed oil had so many beautiful colored barrels that it looked like a huge pack of fire crackers. I remember on one occasion, a load of crude oil was emptied from the barrels in the factory of the N. K. Fairbank Co. in 14th Street, New York. By some mistake a barrel of whisky came in with the oil and the mistake was not discovered until it was emptied into the tank. It did not improve the oil any for lard purposes, and the whisky was spoiled for its customary use.

The committee found there were two distinct methods of refining, namely: agitation of the tanks by air and mechanical methods. They condemned the agitation by air, on the ground that it increased refining losses and incited a decided tendency to rancidity. Mechanical agitation was recommended as giving a minimum loss with the least exposure to air. Three styles of refining tanks were found. First, round tanks with flat bottoms, second, round tanks with conical bottoms and third, square tanks, with semi-cylindrical bottoms. The latter were provided with horizontal shafts and the oil was stirred up very much in the same manner as the water is agitated by the paddle wheels of steam boats. It was found that soap stock in some of the refineries was converted into a cheap grade of marketable soap.

The committee recommended that the strength of the lye be left to the discretion of the refiner. At one place, it was found that the refiner judged the strength of his lye by taking a few drops and rubbing them between his fingers. Methods for finishing the oil varied in different plants. The Union Oil Company used very large settling tanks about four feet deep and eighteen or twenty feet square. Some of those in the Providence refinery which were called finishing tanks were provided with steam coils and placed so as to obtain the full benefit of sunlight from the large windows. The oil was heated to about 220 degrees F. and came out a beautiful light color with a somewhat rancid flavor. This was the material from which the pure salad and the olive flavored brands of the Union Oil Company were produced. The methods of finishing found in the Memphis plant consisted in heating the oil to 120-130 degrees, and blowing air violently through it until it became brilliant. The finished oil was of course rancid. In those days large quantities of oil were sold for miners' lamps and we found that the oil for this purpose was bleached with bichromate of potash and sulphuric acid, and afterwards neutralized with caustic soda. The oil, after this treatment, was chilled in large cellars cooled by ice, and then pressed in cloth bags

(*Turn to p.* 33)

The Nutritive Value of Mayonnaise

Address Before the Fourth Annual Convention of the Mayonnaise Products Manufacturers Association

By E. M. Nelson*

IN ORDER to give a clear picture of the part that mayonnaise plays in human nutrition, it will be necessary to discuss briefly the essentials of a satisfactory diet. There was a time when it was generally accepted that if a man consumed sufficient amounts of mineral elements, proteins, and energy-yielding materials, such as carbohydrates and fats, his nutritive requirements would be satisfied. During the past 20 years our conceptions of a complete diet have undergone many changes because we have found from time to time that some essential had been overlooked. What are the components of a satisfactory diet in the light of what is known today?

Every movement of the body, every physical or mental exertion requires the expenditure of some energy. Also, the human organism must be maintained at a certain temperature or it ceases to function. Let us compare the body to a gasoline engine. The engine will burn gasoline or benzene, or a mixture of the two, to carbon dioxide and water in the presence of air and produce power and heat. But the engine will not run if it is too hot or too cold. Carbohydrates include the sugars and starches. Chemically speaking, the term "fat" includes vegetable and animal oils as well as vegetable and animal fat, but excludes mineral oil. Carbohydrates and fats are normally burned in the animal body to carbon dioxide and water, and the body obtains thereby its energy and heat. In the absence of sufficient amounts of these energy-yielding materials the body burns other substances, notably protein.

The protein of the body may be compared to the stone in a building in which the architect's plans call for many kinds of stone. The building cannot be completed unless there is enough of each of the kinds of stone specified. The protein which we eat must be torn down and reconstructed in the body. In the process of digestion protein foods are broken down into compounds called amino acids, which are then resynthesized into the different types of proteins required by the body. Lean muscle tissue, such as beefsteak, is mostly of protein.

The ash which remains after burning plant or animal matter consists of mineral elements. The bones and teeth are composed largely of minerals, principally lime and phosphorus. The mineral elements also control important body functions. A striking example of the importance of a single element of which we need only minute amounts is that of iodine. An iodine containing compound produced by a small gland located close to the upper part of the windpipe regulates the rate at which foods are burned in much the same manner as a governor on a gasoline engine regulates the amount of gasoline which is burned. If there is not sufficient indigestible material, or roughage, in the food we consume the waste products of metabolism may not be properly eliminated. This is particularly true of people whose physical exertion is limited and whose diet consists largely of food products which may be considered concentrated. The necessity of water is obvious.

Vitamins

WE CAN examine a food chemically and obtain reliable information as to its value with respect to protein, energy-yielding and indigestible materials, and minerals, but a chemical analysis will provide little or no information about vitamins. How, then, do we know such substances exist? Under suitable conditions, if a diet is satisfactory with respect to all known factors except one of the vitamins, a typical abnormal condition or disease will develop. In most cases such deficiency diseases are accompanied by other abnormal conditions. In research work in nutrition, however, animals, such as rats or guinea pigs, are fed a diet which is complete except for one of the vitamins and the material to be tested is then fed in measured amounts to determine how much is necessary to provide the missing factor.

Five vitamins, A, B, C, D, and G, are known to be necessary for a complete human diet.

(*Turn to p.* 23)

*Bureau of Chemistry and Soils, U. S. Dept. of Agric.

Photoelectric Color Measurements

New Precision Instrument Useful in Plotting Energy Curves of the Spectra of Oils[1]

By HAROLD D. ELLSWORTH, MONROE BARNARD *and* PAUL MCMICHAEL

SUMMARY

PRECISION color measurements of oils, fats, waxes, etc. can be made with a Photoelectric Spectrophotometer, and their absorption or reflection determined with a degree of exactness not possible with any visual method.

Oils of similar chemical constitution, although widely different in color, give similar spectral absorption curves.

Oils of dissimilar chemical constitution, although alike when measured on the Lovibond scale, give dissimilar spectral absorption curves.

This photo-electric method of measuring color may enable the oil chemist to make use of a method of color measurement that will disclose fundamental data.

THE December, 1915, issue of the Journal of Franklin Institute, Dr. H. E. Ives said "A spectrophotometric table derived from at least 25 points (for a continuous spectrum) gives the only unique description of a color, and it appears probable to the writer that the requirements of precision color measurement are most likely to be met by the development of simple and rapid means of plotting and recording accurate spectrum plots of reflection or transmission characteristics."

The American Photoelectric Corporation, in collaboration with Eimer and Amend, is developing and building a series of instruments for the accurate measurement of the colors of all substances, gaseous, liquid or solid and transparent, translucent or opaque. By the measurement of colors, we mean the determination of the relative energy distribution throughout the entire spectrum from the extreme ultra-violet through the infra-red. Some of the ideas, upon the application of which the successful operation of this series of light-measuring instruments depends, have been advanced during the past decade by technologists working in this field, but no one, so far as we have knowledge, hitherto has developed any practicable instruments that enable one to make a complete accurate spectrum analysis wholly independent of the human eye.

Because of many patent applications pending and in course of preparation, we are unable at this time to disclose the exact workings of this series of instruments. We can merely say that by a novel utilization of photoelectric cells we have developed means whereby it is now possible to measure accurately, i.e. within 0.1%, the quantity of light transmitted by or reflected from a substance for each wave length in the spectrum. In commercial practice no such sensitivity is required, because even the trained human eye rarely can detect variations in density less than 2.0%. With these instruments the accuracy of determination of hue, saturation, etc., is many times greater than that obtainable by visual methods of measurement.

In his discussion of waves and quanta, Dr. Karl K. Darrow (*Introduction to Contemporary Physics*) says that the solution of several fundamental problems depends upon accurate measurement of the intensity of individual spectral lines and he points out further that there are no means available for making such measurements. We believe that this series of instruments, by making it possible to measure accurately differences in intensity of individual bands in the spectrum, especially those in the ultra-violet, opens the door to extensive and fundamental research on many physical and chemical problems that have baffled technologists simply because there were no means available for discovering the facts. This paper has been prepared at the suggestion of the past president of American Oil Chemists' Society, Mr. H. P. Trevithick, merely to indicate some of the possible uses of these light-measuring instruments in the particular field of oil chemistry.

Apparatus as Developed

THE first picture (Exhibit 1) is a Photoelectric Spectrophotometer designed for making color analyses of transparent substances in the visible spectrum. It consists essentially of (A) a modified Bausch and Lomb constant deviation spectrometer to which

[1]Presented at the Third Fall Meeting of The American Oil Chemists' Society.

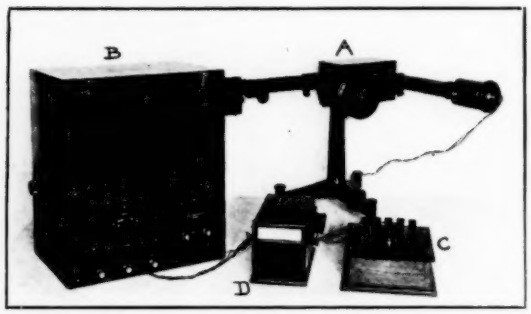


Exhibit 1

a light source has been attached; (B) a case containing the photo-electric devices, on the outside of which is provided an enclosed slide for the material to be examined; (C) a Leeds and Northrup bridge; and (D) a Leeds and Northrup galvanometer. The batteries that are required do not appear in the picture.

The second picture (Exhibit 2) is a Photo-electric Spectrophotometer designed for making color analyses of opaque substances in the visible spectrum. It consists of (A) a modified Hilger constant deviation spectrometer; (B) an opaque illuminator; (C) the case containing the photo-electric devices; (D) a Kohlrausch bridge, made by Leeds and Northrup; and (E) the same type of galvanometer as shown in the first picture.

At this time it might be mentioned that in our laboratories we recently made two color analyses of the same sample of cottonseed oil using for the different analyses different apparatus throughout; i.e. different types of light source, different makes of spectrometers, bridges and galvanometers, and even different types of photo-electric cells, and yet the two color analyses were substantially identical, the maximum variation at any point in the spectrum being less than 0.1%.

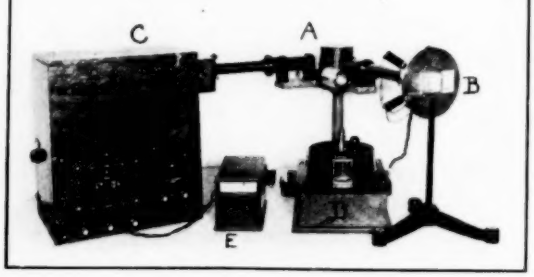


Exhibit 2

The third picture (Exhibit 3) is a Photo-electric Spectrophotometer designed for the determination of the relative energy distribution in the ultra-violet. It consists of (A) a modified Hilger quartz spectrometer; (B) the case containing the photo-electric devices; (C) a Kohlrausch bridge; and (D) a Leeds and Northrup galvanometer. It is, of course, understood that when working in the ultra-violet, whether with transparent or opaque substances, that a light source is employed which is rich in ultra-violet rays, e.g. a Cooper-Hewitt quartz-mercury arc, and that all parts of the instrument through which light passes are of quartz.

One of the daily problems of the chemist who works with animal or vegetable fats and oils is the determination of their color. For this purpose Lovibond glasses are employed, usually glasses that have been calibrated by the U. S. Bureau of Standards.

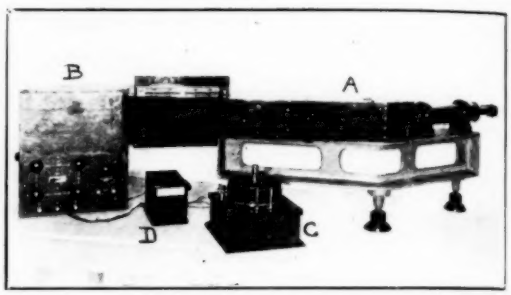


Exhibit 3

The next exhibit (Exhibit 4) shows the transmission curves of four Lovibond red glasses, which were calibrated by U. S. Bureau of Standards. We also calibrated them, using one of the several formulas proposed by U. S. Bureau of Standards. Following is a tabulation of the several values found:—

COLOR VALUES (N)

Lovibond	U. S. Bur. of Stand.	*Amer. Photoelec. Corp.
2.00	2.42	2.35
4.00	4.30	4.40
6.00	6.34	6.15
10.00	10.52	10.21

*Calculated according to one of the several formulae proposed by U. S. Bureau of Standards.

The observations at Bureau of Standards, upon which were based calculations necessary for calibration, were made visually, whereas these curves are based upon measurements made photo-electrically. The Bureau of Standards claims a degree of accuracy of observation within 1.0%, whereas our measurements were made with an accuracy within 0.1%. Even if Lovibond glasses were calibrated with

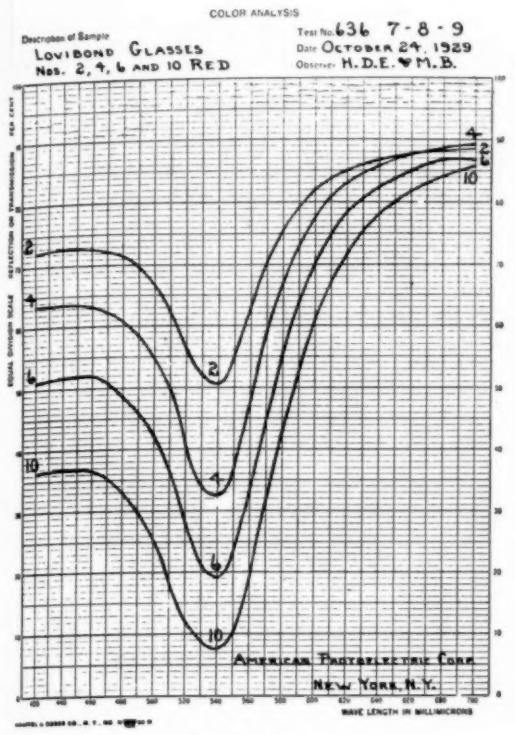


Exhibit 4

the highest degree of precision, the major sources of error would still remain. Priest has pointed out that errors may result from

(1) use of glasses without rule as to number of separate glasses used to match the oil;

(2) use of color comparators (tintometers) of widely different types;

(3) use of illuminants of widely different quality;

(4) color grading of oils by many persons whose color sense and power of color discrimination have never been tested.

In this connection, it may be of interest to note that, while the extreme defects of color vision e.g. color blindness, are more common among men than women, minor defects of color vision are more frequent among women than men, the most common being a periodic disturbance which affects their discrimination in the green and yellow, which has been investigated by Havelock Ellis. Since this is a variable function, testing the color vision would be of little value. It would seem, therefore, that a method of color analysis that develops data expressed in terms of basic physical facts, and subject to none of the sources of error indicated by Priest, would be highly desirable, and such a method is now available.

Color Analyses of Oils

FUNDAMENTALLY, an oil chemist is not interested in the color of a sample per se, but is interested only in so far as the color determination gives him some clue to the chemical or physical characteristics of the oil. The spectral absorption of any substance is a direct function of its chemical constitution and physical characteristics, but, heretofore, no practicable means has been available to industry for the accurate determination of such fundamental data.

The next exhibit (Exhibit 5) shows the absorption curves of two samples of peanut oil, which are widely divergent in color, Sample A being very much lighter than Sample B. The similarity of the curves indicates that the oils are of similar chemical nature, the difference being more of quantity than of quality of coloring matter. Attention is particularly directed to the fact that both absorption curves show sharp changes in direction at 460 millimicrons, at 540, 580, and at 675 millimicrons. If chemical differences exist we might expect them to be reflected in changes in shape of the

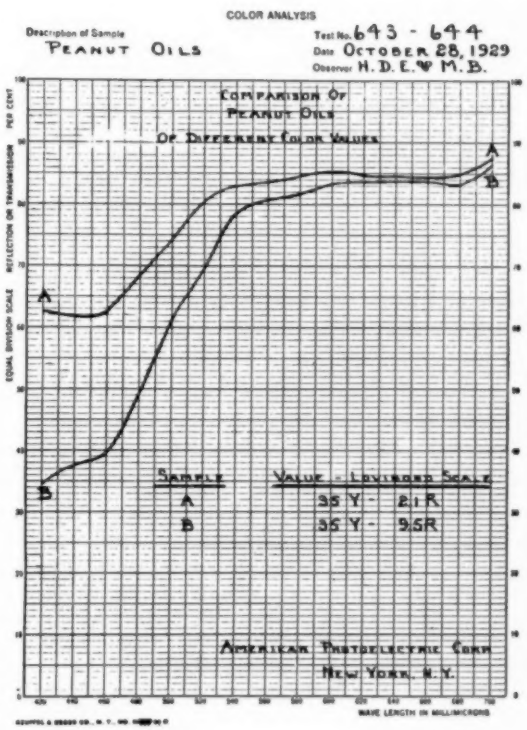


Exhibit 5

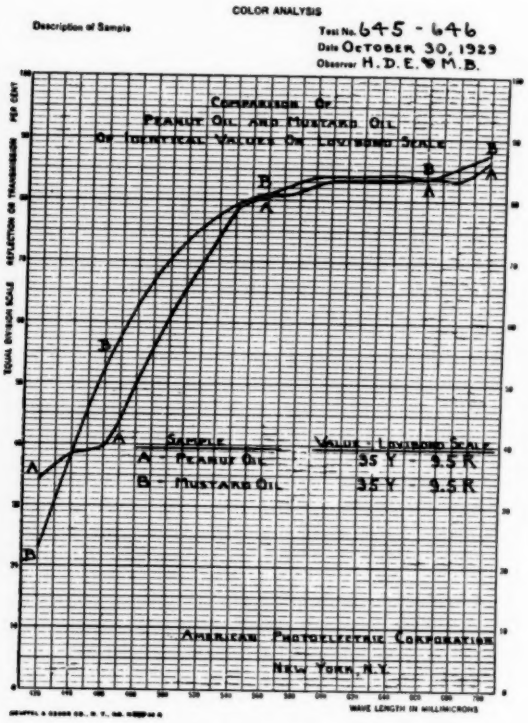

COLOR ANALYSIS
Description of Sample
Test No. 645 - 646
Date OCTOBER 30, 1929
Observer H.D.E. & M.B.
COMPARISON OF
PEANUT OIL AND MUSTARD OIL
OF IDENTICAL VALUES ON LOVIBOND SCALE
EQUAL DIVISION SCALE REFLECTION OR TRANSMISSION PER CENT
SAMPLE
A - PEANUT OIL
B - MUSTARD OIL
VALUE - LOVIBOND SCALE
35 Y - 4.5 R
35 Y - 4.5 R
AMERICAN PHOTOELECTRIC CORPORATION
NEW YORK, N.Y.
WAVE LENGTH IN MILLIMICRONS

Exhibit 6

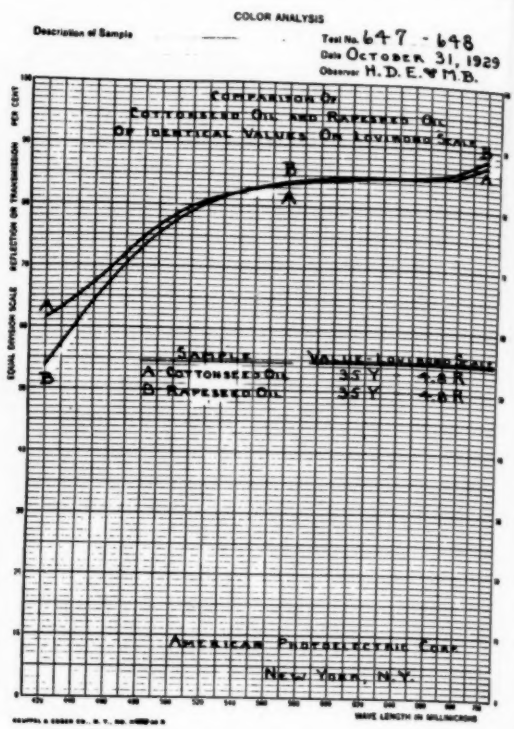


Exhibit 7

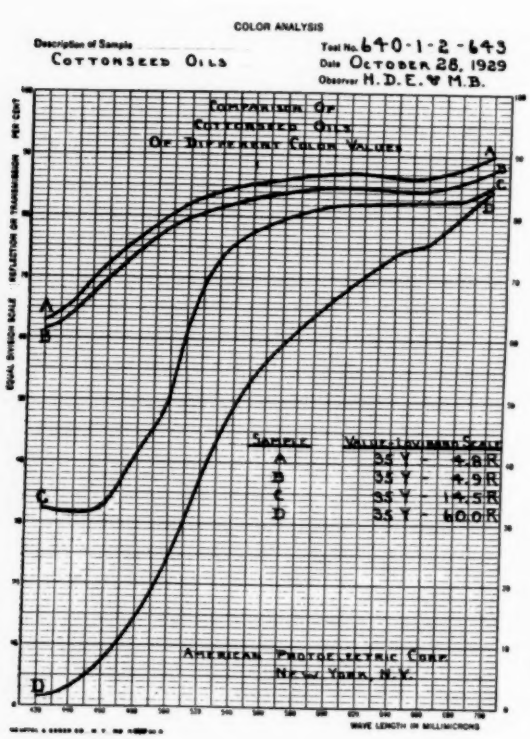


Exhibit 8

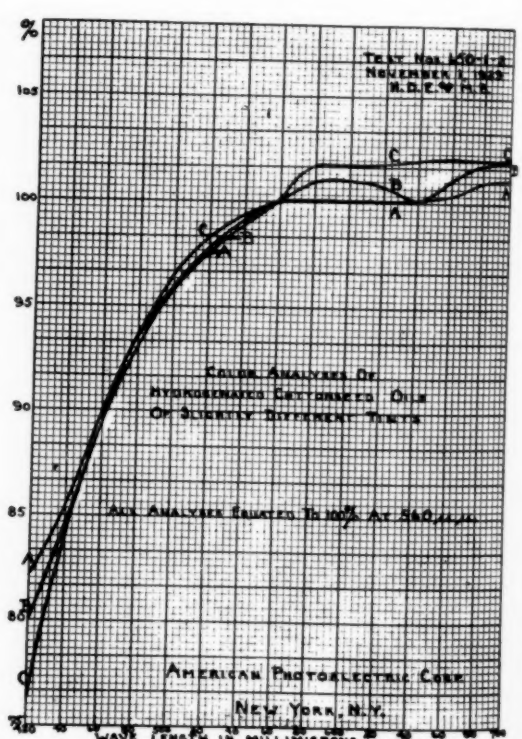


Exhibit 9

spectral absorption curves. The next exhibit (Exhibit 6) shows two different kinds of oil that have identical values on the Lovibond scale, one a peanut oil and the other a mustard oil. These curves indicate that oils of dissimilar chemical composition have distinctly dissimilar spectral absorption. This is most evident in the sharp breaks in the curve of the peanut oil at 460 and 540 millimicrons, which are not present in the curve of the mustard oil.

Another example of detection of chemical differences by the determination of absorption curves is shown in Exhibit 7. Here we have a comparison of the curves of rapeseed oil and cottonseed oil of identical Lovibond readings. While the difference is not as great as that existing between the curves of peanut oil and mustard oil, the steeper slope of the curve of rapeseed oil distinguishes it clearly from that of cottonseed oil.

Another valuable point is illustrated by Exhibit 8. Here we have the curves of four cottonseed oils. A, B and D are similar, but curve C shows marked peculiarities which indicate chemical differences. The changed spectral absorption of this sample in the blue end of the spectrum is perhaps due to overheating.

These important distinctions are not discoverable by means of visual color matching and yet they may be of primary importance in the determination of the kind of oil, or of the treatment to which it has been subjected. The compilation of reference data consisting of the curves of oils of known composition and treatment would enable the oil chemist to interpret results. Such information would make possible a more exact and efficient control of oil production.

Nor is the method limited to oils alone. The spectral absorption of such products as hydrogenated cottonseed oils, soaps, etc. may be measured equally well. Exhibit 9 shows the differences of tint between three hydrogenated cottonseed oils. A, which is whitest, is higher than B or C at the blue end of the spectrum and lower at the red end. That is to say, it most nearly approaches pure white, which would be represented by a straight line at 100%. C, which is yellowest, has opposite characteristics. That is to say, it is lowest in the blue and highest in the red, while B is of intermediate tint. The extension of this method into the ultra-violet and infra-red would be extremely valuable, and measurements in these regions may be made with a comparable degree of accuracy. Furthermore, the measurement of curves of decay of luminescence, which are of too short duration to be measured visually, may be accurately determined.

We thus see that this method enables us to determine color characteristics more accurately than the visual method, to discover facts which the visual method does not, and to extend measurements into those spectral regions where the visual method does not apply, and where, at present, the result is largely a matter of guesswork. Thus, with means available for obtaining fundamental data, it now becomes possible to set up standards, mathematically expressed and capable of reproduction, that will enable one to exercise a more rigid control over production and distribution of all sorts of products, and this series of instruments gives to pure and applied research a new set of tools having a degree of accuracy never before attained.

Coconut Oil Industry in Cuba

The manufacture of vegetable oil compound from coconut oil is reported to be meeting with great success in Cuba, and the consumption of the product is stated to be, at present, about 2,500,000 pounds monthly. It is necessary to import the coconut oil, since the production of coconuts in Cuba has been greatly reduced by a disease which attacks the palms. "*Comercia*" of Habana states that the Secretary of Agriculture is impressed with the importance of the industry and has given orders that the Agricultural Experiment Station establish nurseries for the coconut palms and that experimental work be carried on in the cultivation of peanut, sesame and other oleaginous seeds. The foregoing information was reported by Consul Keena at Habana, Cuba.

Exports of Palm Products from Nigeria, 1928

During the year 1928 there was exported from Nigeria 246,638 tons of palm kernels valued at £4,423,114 ($21,522,873) as compared with 257,206 tons valued at £4,438,886 ($21,599,619), during the previous year. Exports of palm oil totaled 127,111 tons valued at £3,751,484 ($18,254,721) during 1928 as compared with 113,240 tons valued at £3,374,-550 ($16,420,560) during 1927. (Report from Consul Fernald at Lagos, Nigeria.)

Development of the Wood Rosin Industry

Address Presented Before The Third Fall Meeting of The American Oil Chemists' Society

By E. V. ROMAINE

IN ORDER that you may obtain a clearer understanding of the beginning of the wood rosin industry, permit me to present briefly the history of the gum products class (gum rosin and turpentine). The year 1606 marks the beginning of the naval stores industry in North America. The French, then located at Port Royal (Annapolis, Nova Scotia), produced some turpentine. In the United States the industry had its beginning in 1642 in the New England States, principally along the Connecticut River. Here the industry developed quite rapidly but was comparatively short lived. The yield per tree was small, due to the type of tree and the short working season, and the forest soon became depleted.

We first hear of the production of naval stores in the South (North Carolina) in 1665, but it did not become well founded until the period of 1710-1715 which marks the beginning of the industry on a commercial basis in the South. Here the industry took a new lease on life. There was apparently an unending supply of virgin timber, and the type of pine tree, the long leaf yellow pine, (*Pinus Palustris*), was rich in oleoresin, the working season was long, therefore the yield of crude gum per tree was much greater than in the North, and the cost of production was less. Consequently, the industry developed rapidly and by 1770 had practically supplanted the industry of the North. The South, therefore, became the permanent home of the naval stores industry of the United States. In 1720, the industry in the South produced 6,000 barrels of tar and pitch; by 1753, the total annual production had increased to 84,000 packages of tar, pitch and crude gum. In 1850, one hundred years later, the total production was 617,588 barrels of rosin, pitch and turpentine. During the next 50 years, 1850 to 1900, the industry experienced its most rapid growth, and in 1900 produced 620,000 bbls. (50 gals.) of turpentine and 2,065,000 bbls. (500 lbs.) of rosin, a total of 2,685,000 packages, an increase of 435%.

It was during this period, particularly the last ten years, that rosin became recognized by other industries as a very valuable raw material, and many large uses were developed, with the result that it soon advanced to a very important position, being today perhaps the most important industrial commodity of the naval stores industry. The industry, being planted and entrenched in those fertile surroundings and enjoying the prosperity justly due it, paid little heed or gave little attention to what the future held for it. It was the belief of many that these immense virgin forests would never cease to produce, and so, as many in the case of other industries whose raw materials are nature's gifts to man, this industry ruthlessly squandered its gifts. The inevitable approached. Production was increasing at a rapid rate, but increased naval stores operations, lumbering, fires, etc. took their toll and the magnificent, tall, stately pine trees, from which flowed these valuable products, so necessary for modern industries, were vanishing at an alarming rate. By 1900, or shortly thereafter, the future for the naval stores industry became somewhat problematic. At this time the Government issued several publications calling attention to the seriousness of the situation and requesting that something constructive be done for the future of naval, particularly rosin. Some people, realizing that in that vast expanse of cut-over land lay many millions of pine stumps, tops, limbs, etc., each having locked within its fibrous walls those valuable and essential products which would if permitted to remain there, be forever lost, gave their time and money to thought and experiments relative to the recovery of those products.

The first successful process developed was the "Destructive Distillation Process" in 1872. A second, known as the "Steam Distillation Process" was tried quite extensively, but did not prove to be commercially successful, due to the low yields and price of turpentine. These two processes, though they produced satisfactory products and the former proved commercially successful, came far from relieving the situation, since only the volatile products were recovered and the rosin, the most desired naval stores product, was either destroyed or left in the wood. It was evident, therefore, that a

process should be sought and developed by which the rosin as well as the volatile products could be recovered. Such a process was developed by Homer T. Yaryan, and in 1909 a plant was erected at Gulfport, Mississippi, which, in the first year of its operation produced 14,300 bbls. (500 lbs.) of wood rosin, 1,700 bbls. (50 gals.) of steam distilled turpentine and 1,700 bbls. (50 gals.) of steam distilled pine oil, a total of 17,700 packages. The Yaryan process consisted of first hogging the wood, second, steaming it to remove the volatile products, and third, extracting the rosin with a volatile solvent, which in principle is the present "Steam and Solvent Process." Since its beginning, however, many changes have taken place. The process has been developed to a very high degree of efficiency, and with these changes have come changes in the products, so that today these are of high quality indeed.

The process in general, which is under very careful chemical control, is as follows: The stump and lightwood (branches) of the long leaf yellow pine tree (*Pinus Palustris* or *Pinus Australis)* is collected and transported to the plant in various kinds of conveyances, such as wagons, auto trucks and freight cars, the latter being specially designed for the purpose. The wood, as it is received at the plants, is very carefully graded, the grades properly mixed and prepared for treatment by first hogging and then shredding into small chips.

The prepared wood, as required, is charged into the retorts where is is treated first with superheated steam and then with a solvent. As the steam passes upwards through the mass of chipped wood, it carries with it the turpentine and a certain amount of the Pine Oil. The mixed vapors as they leave the retort are condensed and led into tanks known as separating tanks where the mixed oils are separated from the water. After separation the oils are chemically treated, after which they are transferred to stills equipped with fractionating columns and separated very carefully by fractional steam distillation. The turpentine and pine oil thus obtained are analyzed to determine whether or not they conform to specifications, and if found to do so are transferred into storage tanks or directly into tank cars or drums as required.

After the chipped wood has been treated with steam for a certain length of time, or until the turpentine has all been removed, it is treated with the solvent which extracts the balance of the pine oil and the rosin. At the conclusion of this treatment the pine oil rosin solvent mixture is transferred to tanks, where it is partially refined and the wood, which is now known as spent wood, is removed from the retorts and either used as fuel or for other purposes. The partially refined mixture is transferred into stills where the solvent and pine oil are removed from the rosin and very carefully separated from one another by fractional steam distillation. Since the rosin does not distill with steam it remains in the still as a residue and its treatment from this point on depends upon the grade and brand required, that is to say, the rosin is treated according to the chemical and physical properties desired.

The present year is the twentieth anniversary of the wood rosin industry, and in this short period the annual production has increased approximately 3000%. During the season of 1928-1929, 431,654 bbls. (500 lbs.) of rosin, 77,896 bbls. (50 gals.) of turpentine and 53,542 bbls. (50 gals.) of pine oil, a total of 563,092 packages, were produced. Shortly after 1909 others entered the field, and in the season of 1913-1914, 129,168 bbls. (500 lbs.) of rosin, 19,532 bbls. (50 gals.) of turpentine and 5,836 bbls. (50 gals.) of pine oil, a total of 154,536 packages, were produced, an increase of 878%. Then followed the war period, the inflation period and the depression in 1921. During the period from 1913-1914 to 1922-1923 production varied considerably, and in 1922-1923, 166,146 bbls. (500 lbs.) of rosin, 33,743 bbls. (50 gals.) of turpentine and 18,805 bbls. (50 gals.) of pine oil, a total of 218,424 packages, were produced, which represents an increase of 141% over 1913-1914.

From 1922-1923 to 1928-1929 the production has increased at a regular rate, and in the latter year it was as previously stated, which represents a percentage increase of 246%, and in rosin was equal to about 19% of the total rosin, (wood and gum) or about 23% of the gum rosin produced in the same year. Until 1928 only one color grade, "FF" of wood rosin was produced, but in the early part of that year "I" grade became a reality, and in the early part of 1929 paler grades than "I" were being produced. From this date it is evident that the wood rosin industry has enjoyed a rapid but healthy growth, that its principles and purposes are sound and logical and that its products are considered and accepted by the consuming industries today as desirable and standard commodities.

Throughout the development and growth of the Industry many problems were encountered and many achievements accomplished. Certainly no more conclusive proof could be desired to show the successful solution of the problems than is evidenced by the statistical information just quoted, for an industry can

(*Turn to p. 29*)

Nutrition and Mayonnaise

(*From p.* 13)

A deficiency of vitamin A manifests itself by a disease of the eye called ophthalmia, and changes in the mucous membranes of the respiratory and urinary tracts. Infections of the respiratory tract and ear are common when vitamin A is lacking. Beri beri, a disease characterized largely by a degeneration of the nervous system, results from a lack of vitamin B. In scurvy, which is caused by insufficient vitamin C, the bones become brittle, the joints and gums sore and swollen, the teeth loose, and there is evidence of the rupture of small blood vessels usually localized in certain areas. In the absence of vitamin D calcium and phosphorus are not properly utilized and in the young child rickets will develop. Deficiency of vitamin G leads to pellagra, a disease which is prevalent in the Southern States.

Let us now consider what mayonnaise contributes toward furnishing the essentials of a diet which have been mentioned. Analyses show that commercial mayonnaise contains approximately 77 to 83 per cent of vegetable oil, 7 to 11 per cent of commercial egg yolk, from 0.3 to 0.5 per cent of acetic or other organic acid, a small amount of condiments, and water. The vegetable oil can be utilized almost completely as a source of energy. Experiments have shown that approximately 98 per cent of vegetable oils of the type used in mayonnaise are digestible. The egg yolk is a satisfactory source of four of the vitamins, A, B, D, and G. In fact, the egg stands out as an important source of vitamin D among the foods which are extensively eaten. The protein of egg yolk contains all the amino acids known to be necessary for body protein formation. Egg yolk is a good source of mineral elements, being particularly rich in the elements iron and phosphorus, which may be low in the average diet. The relative distribution of the other mineral elements in egg yolk is not much different from their distribution in milk. Fat and fatlike materials which yield energy are important constituents of egg yolk. The acetic acid or other organic acid in mayonnaise will yield some energy, but the amount is negligible. The condiments are used to increase palatability.

There has been a growing tendency of recent years to emphasize far beyond justification the nutritive value of this or that food or food product because it contains one or more of the essential components of a complete diet. It is quite probable that any one of these products could be removed from our reach entirely without noticeably affecting the health of the nation. The American people who consume mayonnaise are eating about as satisfactory a diet as they can be induced to consume. That the American will not make his diet an ideal one is well exemplified by the extensive use of many substances of little or no nutritive value. It can truthfully be said that mayonnaise is in part responsible for making the diet of a great many people approach the ideal. Although we may maintain health with little or no milk, green, leafy vegetables or fruit, the probabilities are that our diets will be much more adequate if these foods are included, and there is no denying that a salad dressing, such as mayonnaise, increases the quantity of green, leafy vegetables and fruits consumed. The enhanced palatability and attractiveness of a lettuce or tomato salad with a "dab" of mayonnaise leads to a greater consumption of such raw foods. Green, leafy foods have been classed with the so-called protective foods in that they supply some dietary essentials which are frequently lacking in our food. Calcium is one of the mineral elements which is frequently low in the diet, particularly if milk and dairy products are used only in limited amounts. The green, leafy foods help to make up the deficiency. The indigestible residue or roughage in leafy vegetables is particularly desirable when a large part of the diet consists of concentrated foods. Raw foods can also be depended upon to furnish vitamin C in greater amounts than foods subjected to cooking. The selection of a salad at a cafeteria or the desire to eat one at home is largely dependent on its appearance which is made more attractive by a suitable dressing.

Food Appeal

THERE is another aspect in the use of mayonnaise which is not so readily defined or described, and that is with reference to appetite and digestion. A healthy man whose occupation calls for tremendous physical exertion can consume a very large meal amid surroundings that would be repulsive to many of us, and yet he enjoys his food to the utmost. He is accustomed to such surroundings, and his appetite is so great that it is not dependent on the appearance of food. On the other hand the sedentary worker, whose exertions are largely confined to that part of the body above the shoulders, does not have a desire or need for large quantities of food Many of these people have become accustomed to associate palatable meals with pleasant surroundings and the attractive appearance of

(*Turn to p.* 33)

Lovibond Glass Standardization

Correspondence Between The Bureau of Standards, The Tintometer, Limited, and The Editor

THE attempts of the Bureau of Standards to serve the vegetable and animal oil and allied industries by evaluating and standardizing Lovibond color glasses for use in determining the colors of oils have formed the basis of a letter addressed to the Editor of *Oil & Fat Industries* by The Tintometer, Ltd., with a request for publication. A copy of this letter was forwarded by The Tintometer, Ltd. to the Bureau of Standards. The Director of the Bureau has kindly furnished *Oil & Fat Industries* with a copy of the Bureau's official letter to The Tintometer, Ltd., commenting on the letter addressed by that firm to the Editor. As the standardization of color reading instruments and methods is of major importance to all manufacturers and dealers in oils and their derived products we publish herewith this correspondence in full:

The Colour Laboratory,
1 The Friary,
Salisbury, England.

The Editor,
Oil & Fat Industries,
136 Liberty Street,
New York, U. S. A.

Sir:

In view of the recent criticisms which have been made concerning The Lovibond Colour Standards by The Bureau of Standards and others, many of which have been published in your Journal, we think the following will be of interest to your readers, and trust you will find room to print it in your Journal.

The Tintometer was invented by the late Mr. Joseph W. Lovibond of Greenwich and Salisbury in about the year 1887. The original Tintometer being fitted with an arbitrary brown series of standards for personal experiments.

The Scale: The success of this Instrument was so encouraging that he then constructed The Permanent Red, Yellow and Blue Scale of standards by which all colours can be matched and recorded.

Source of Light: The Inventor in all his Works, stresses the necessity for using the standards in the apparatus for which they are made, in normal diffused north daylight.

Visual Standard: The Lovibond Colour Scale was intended as a *physical* colour standard, to be used under specified conditions for *visual* comparisons.

Proof of Efficiency: The apparatus has justified its existence and is used universally in a vast number of Industries.

Claims of the Inventor: The Inventor, and the Company manufacturing the apparatus only claim visual uniformity of the standards when used in the apparatus for which they are made, under the prescribed conditions.

The Tintometer Limited do not vouch for the standards when used under any other conditions.

The Causes of Dissatisfaction are invariably due to departure from the specified conditions of use by the employment of unsuitable apparatus illuminated by unstandardized sources of light other than that for which the standards were made.

The Criticisms are based upon: (a) Spectral Transmission of the glasses, *which the makers do not claim to have standardised.* (b) Tests made in apparatus other than that specified by the Inventor. (c) Tests by means of the Martens photometer in which the "effective portion of each glass is symmetrical about the geometric center of that glass." (This is not the part of the glass standardised for use in the Tintometer, and the makers do not claim visual standardisation of the area "about the geometrical center.")

Use of the Standards by artificial Light: If it is impracticable to use diffused north daylight, then some easily standardised artificial light must be adopted in a standard form of instrument, mutually agreed upon, and the standards graded for use in that particular instrument illuminated by that particular form of illumination. Such standards would not be interchangeable in other instruments. Upon these lines The Tintometer Limited have expressed their willingness to co-operate with the Bureau of Standards and extend the same offer to the American Oil Chemists' Society.

Caution: The Tintometer Limited most emphatically caution everyone against the indiscriminate use of the Lovibond Tintometer Standards in apparatus other than that manufactured by The Tintometer Limited, in light other than diffused north daylight.

We are,

Yours faithfully,
THE TINTOMETER LIMITED,
(Signed) C. Headley,
Chairman.

Department of Commerce

Bureau of Standards
Washington

The Tintometer, Ltd.,
(Attn. Mr. C. Headley, Chairman),
Salisbury, England.

Subject: Standardization of Lovibond Glasses by the Bureau of Standards.

Gentlemen:

1. This will reply to your letter of October 1st (received October 26th), transmitting copy of a statement which you are submitting for publication in *"Oil and Fat Industries."*

2. Before taking up details, we consider it opportune to make a few comments relative to your attitude (as manifest in this and previous letters) toward our standardization and calibration of Lovibond glasses. We have already dealt with this matter rather fully in our letters of October 24, 1927 and January 5, 1928 to you; and, in order to avoid unnecessarily lengthy repetition, we request that you read these letters again. However, for the sake of making our position perfectly clear, we state some of the relevant fundamental facts and principles as follows, even at the cost of some tedious repetition:

(1) The lack of uniformity of color among Lovibond glasses having the same nominal value was *not originally discovered* by us but (much to their own cost and inconvenience) by the practical users of these glasses in the vegetable oil industry in America —particularly by the members of the American Oil Chemists' Society.

(2) The *fact* that the actual color differences between glasses having nominally the same value (engraved numbers on the glasses) are large compared to the nominal fineness of grading is patent, obvious, and incontrovertible. No recondite nor elaborate technical investigation is required to discover this fact. This conclusion is *not* necessarily based on measurements of spectral transmission nor any other measurement which might be mysterious or confusing to the layman It may be *seen* by any one having normal color sense by simply *comparing* the glasses side by side in "diffused North Daylight" (or any other illumination fairly representative of daylight).

(3) The investigation and calibration of Lovibond glasses which we are carrying on was *not* undertaken on our own initiative, but only in compliance with the urgent and insistent requests of the users of these glasses in America—particularly the American Oil Chemists' Society (formerly the Society of Cotton Products Analysts). In complying with the requests of a large group of citizens representing an important industry, we are only discharging our duty as the national standardizing agency—a duty which cannot be evaded, particularly since these citizens have shown their sincere interest and good faith by themselves contributing freely both their own time and their own money to this investigation. Except for these circumstances, we would be very glad indeed to be free of investigating and calibrating Lovibond glasses and making reports in regard to them. If you object to having your glasses investigated, we would therefore respectfully suggest that you make your complaint directly to the purchasers and users of the glasses and, if you desire, stipulate in the articles of sale that they are sold only on condition that they shall not be standardized nor calibrated nor certified by any agency except yourselves. Or, if you believe that the calibration could be done more satisfactorily to you by some reputable standardizing agency other than this Bureau, we suggest that you arrange to have the glasses certified by the corresponding British agency, the National Physical Laboratory.

(4) We have no intent nor desire to injure your reputation nor your business. Our sole purpose and endeavor is to tell the truth to those who employ us for the purpose of finding out the truth about these glasses.

(5) We would also emphasize that, far from injuring your business in America, our efforts in standardizing your product contribute very materially to *increasing* your sales. We would recall again that the errors in these glasses were first discovered by their users—not by us. Unless some such standardization as we are carrying on succeeds in restoring confidence in the glasses, it appears highly probable to us that the present users of these glasses will be compelled to abandon them entirely and resort to some more satisfactory method of color grading.

(6) As to your fear that the publication of our findings may injure your reputation, we are of the opinion that nothing could be better adapted to injuring it in this country than the publication of such statements as that which you are requesting the Editor of *"Oil and Fat Industries"* to publish. On the other hand, your cordial encouragement of a plan for having your glasses certified by an independent and impartial standardizing agency would greatly enhance your reputation and confidence in your glasses among American users of them.

3. We shall now make some specific comments upon the statement which you have requested the editor of *"Oil and Fat Industries"* to publish:

(1) The paragraphs headed as follows, while of some historical or other collateral interest, appear to be irrelevent to any discussion of the merits of our work or the correctness of our findings: *"The Tintometer," "The Scale," "Proof of Efficiency."*

(2) Your statement under *"Source of Light"* appears to be in error. We quote from page 10 of Mr. Lovibond's book "Light and Colour Theories" (published by E. and F. N. Spon in 1915) as follows:

"The real difficulty was in obtaining this equivalence, because a balance which transmitted a neutral tint by one light developed colour by another. This necessitated the selection of a standard light. The light finally selected was that of a so-called sea fog, away from the contaminating influence of towns. The white fog of Salisbury Plain was used as being most available."

Some of the comparisons of glasses (about one tenth of total) reported in the article to which you refer (*"Oil and Fat Industries,"* Vol. VI, No. 9, p. 27; September, 1929) *were made with natural north sky illumination.* The remainder were made by artificial noon sunlight. When the change of illumination was made, eight glasses (viz.: maker's numerals 1.0, 2.2, 4.0, 5.0, 5.0, 5.7, 6.0, 6.0) were actually checked by *both* illuminations. Check observations to determine the effect of changing the quality of illumination were made by two observers and it was found that the effect was entirely negligible, sensibly the same results being obtained by the two illuminations. That this would be true in comparing *glasses having approximately the same spectral transmission* is indeed obvious, *a priori* without making the test, to any one acquainted with the principles of colorimetry. The exact specification of the quality (spectral distribution of energy) of the illuminant is only of importance in using the glasses to specify the color of something which has a spectral transmission (or reflectance) notably different from the spectral transmission of the glasses.

(3) In comment upon your paragraph *"Visual Standard"* we may say that the comparisons in question were made *visually.* Specifically, the glass to be calibrated was placed so that its color (by north sky or artificial sunlight illumination) appeared in one half of a photometric field. The person making the comparison then selected, by trial, standard glasses to match this color (a brightness match being simultaneously made by adjustment of the Martens photometer). The positions of the standards and the glass under test were then reversed (to eliminate any slight error due to asymmetry of the apparatus or the observer's eye) and the judgment of match made

again. Finally, the glass being calibrated was assigned the grade given by the standard glasses found to *visually* match it. The apparatus as used with north skylight has been fully described in *"Oil and Fat Industries,"* Vol. V, No. 1, pp. 16-19; January, 1928. In changing to artificial noon sunlight the only material change made was to substitute the artificial sunlight for the natural north sky light.

(4) In comment upon your paragraph *"Claims of the Inventor"* we have only to say that the publication to which you refer (*"Oil and Fat Industries,"* p. 27, September, 1929) concerns only the color of the glasses, in daylight, as compared by methods which we deem sufficiently sensitive, convenient, and suitable to the making of such comparisons with a high degree of accuracy. However, if the lack of uniformity which we have found and reported is not found by comparing the same glasses, in daylight, by other apparatus and methods of comparison, it will undoubtedly be due to the circumstance that such apparatus and methods are not sufficiently sensitive to disclose the differences in question. Likewise, if two nominally one-gram weights, which we had found to differ by one milligram by carefully comparing them on a sufficiently sensitive balance, were reported to be equal as the result of less careful comparison on a crude balance having a sensitivity of only one centigram, this finding of equality would have no bearing on our report.

(5) In comment upon your paragraph *"The Causes of Dissatisfaction,"* we refer to our comments (3) and (4) just above.

(6) Referring to your paragraph *"The Criticisms . . ."* we submit the following statements:

(a) The findings as to lack of uniformity of glasses bearing the same scale numeral (N), in the paper to which you specifically refer (*"Oil and Fat Industries,"* Vol. VI, No. 9, p. 27; September, 1929) are *NOT* based upon the spectral transmission of the glasses. In fact, the spectral transmission of very few, if any, of these glasses has been determined. (The manner in which this lack of uniformity was found has been described under [3] above.) Data on spectral transmission were used as a convenient and accurate method of establishing our standards so that they would conform to the additivity law: for example, so that the quality of color of two glasses each graded as 1.0 would be the same as the quality of color of one glass graded as 2.0. (Cf. the following publications:—(1) J. O. S. A. & R. S. I., *16*, p. 116; February, 1928; (2) B. S. Res. Paper No. 58, p. 800; April, 1929). However, having established our standards by the use of data on spectral transmission, *we then verified the results by direct visual comparison of the colors of single glasses with the colors of various combinations, and also various combinations one with another, until we were satisfied that our results were in sufficiently close accord with the results of direct visual comparison of colors as colors.* We are certain that, by the use of spectral transmission data, we have established red and yellow standards much more in accord with Mr. Lovibond's ideal than were ever established by any one heretofore.

(b) We believe we have discussed the question of the use of "apparatus other than that specified by the Inventor" at sufficient length above and in our earlier letters to you. In our letter of October 24, 1927 we said: "Unfortunately, a multiplicity of ways of using the glasses to grade oils has grown up in America. Some instruments (with immediately juxtaposed fields) accentuate differences in brilliance (dependent upon the fraction of white light transmitted by the glasses), while others with separated fields, e.g., your own tintometer, obscure brilliance differences and relatively enhance hue differences. The type of comparator to be recommended depends upon the end sought, but, of course, comparable results in grading oil depend upon the use of identical instruments by all users. We are attempting to educate the users on this point. You may be assured that glasses standardized by us will be suitable for use in your 'tintometer' . . . In order that we may show and demonstrate it to users of your glasses, we would be pleased to have you send us an exhibit model of the instrument which you recommend for reading the color of oil (5¼ inches) in terms of Lovibond glasses. It would greatly help the situation to have here, for educational purposes, an exemplar of the instrument approved by you." We particularly invite your attention to the last two sentences of the above quotation from our previous letter. In your letter of November 21, 1927 replying to the above, you said: "We will certainly send an exhibit model of our Tintometer for demonstration purposes." In our letter of January 5, 1928 to you, we said:- "We have not received the exhibit model of the Tintometer which your letter mentions as being sent to us." We now add that we have not yet received it, nor have we received any further advice from you concerning it.

(c) We are quite unable to grasp the significance of your statement that "the makers do not claim visual standardization of the area 'about the geometrical center'." In specifying the particular part of the area of the glass for which the color was reported, we merely took into account that this was (or might well be made) the effective part, and guarded against the fact that the color *might* not be exactly the same over the whole area. If the color is uniform over the whole area, no harm is done. But, if you do not standardize this part, it seems to us incumbent on you to state what part you *do* standardize and not merely state what part you do *not* standardize.

(7) We make the following comments on your paragraph *"Use of the Standards by artificial Light"*:

(a) As indicated above, the exact specification of the quality of daylight used in comparing Lovibond glasses with Lovibond glasses (which is the matter with which we are primarily concerned) is not of great importance, but it would be just as well to establish a standard illumination for this purpose. In using the glasses to grade oil, a more precise specification of the quality of illumination is desirable; and we join with you in urging that a standard be adopted. We recommend for this purpose an artificial light having the quality of the overcast sky. This is substantially equivalent to Mr. Lovibond's recommendation of "sea fog" or "The white fog of Salisbury Plain" ("Light and Colour Theories," p. 10), and also equivalent to your present recommendation of "diffused North Daylight" *provided that the sky is overcast.* However, it is notably different from "diffused North Daylight" if the day is clear and the north sky blue. As a matter of fact, it is obvious on a moment's thought that in recommending natural "diffused North Daylight," you are recommending a very variable standard which changes daily and hourly with the weather.

(8) Any comments which we might make on your paragraph *"Caution"* would involve needless repetition of comments already made above.

4. We now return to the specific questions in your letter of October 1, 1929:

(1) The instrument mentioned in the last paragraph on p. 27, No. 9, Vol. VI of *"Oil and Fat Industries,"* about which you inquire consists essentially of:

(a) A Martens photometer, used as a convenient means of bringing the oil color and the color of the glasses into immediate juxtaposition to facilitate their comparison, and as a means of equating the brilliance of the two, and (if desired) as a means of measuring the white light transmission of the oil relative to that of the glasses.

(b) A series of wheels carrying red and yellow glasses arranged so that, by merely turning the wheels, any combination of glasses required to match the oil may be brought into the field of view. (This, of course, is a mere matter of mechanical convenience in selecting the proper combination of glasses to match the oil. It would save a great deal of time in the handling of glasses and would, to a considerable degree, prevent their becoming soiled, scratched, and broken by accident.)

(c) A suitable tank and support for holding the oil sample.

(d) Two gas-filled tungsten lamps to provide light.

(e) A white lined housing for the lamps.

(f) An optical train which receives light from the interior white wall of the lamp housing and passes it through the oil and the glasses, so that light from the same source illuminates the two halves of the photometer field, that which illuminates one half having passed through the oil while that which illuminates the other half has passed through the glasses.

(g) A Davis-Gibson filter (Cf. [1] Proceedings of the Seventh International Congress, held in London, July, 1928, pp. 161-173; [2] B. S. Tech. News Bulletin No. 138, pp. 143-144, October, 1928; and (3) J. O. S. A. & R. S. I., *16*, p. 332; May, 1918. Copies enclosed.) designed to convert the light from the lamps into artificial daylight of prescribed quality (spectral distribution).

This instrument has not been used except in our preliminary experiments with it. Only one model has been completed; and we are not in position to send you one.

(2) We have done considerable work on the calibration of the glasses which you sent us; but cannot set a definite date for their return. The red glasses have been compared with our red standards by one observer. We intend to have them compared independently by one or two other observers. Spectral transmission measurements have been made on all of the yellow glasses and 18 red glasses; but these data are not final. We would remind you that we only offered to calibrate twenty *red* glasses for you free of charge (paragraph 7, our letter of January 5, 1928). We find that you have sent us 35 red glasses, 30 yellow glasses and 29 blue glasses. We are expediting the calibration of the red glasses. We have never standardized blue glasses because there has been little or no call for us to do so. Since American interests do not demand it of us, it now seems unlikely that we shall undertake to complete a fundamental standardization of the blue glasses. There would seem to be little or no excuse for our doing so except on your request; and we infer from your several letters that you would deprecate and discourage such standardization rather than request it.

(3) In comment upon your statement, "We would appreciate communications concerning our glasses being sent to us direct rather than seeing them by chance in the press," we submit the following statement:

We have taken care to send you our publications, and trust that you have received them, although they have not always been acknowledged by you. The article to which you now refer (*"Oil and Fat Industries"* p. 27, September, 1929) was not an official publication and we had no convenient means of sending it to you. It was not published on our initiative. The material therein was merely sent to Mr. Putland, President of the American Oil Chemists' Society, as a summary of our findings on 1000 glasses which he had submitted for calibration, these glasses being the property of individual members of the society. Mr. Putland evidently thought (quite properly, we believe) that this summary would be of sufficient interest to the members to justify publication in their journal. We are now preparing the same material for official publication with a more detailed treatment of it; but as to the present publication, we obtained our first knowledge of it in the same manner in which you did, namely by seeing it in print when the journal came in our mail. We never had any extra copies of this publication, and so have not been in position to send you one.

Respectfully,

(Signed) L. J. Briggs, Acting Director,
George K. Burgess, Director.

Enclosures:

Davis & Gibson: "Artificial Sunlight . . . ", 7th Intern. Con. of Phot. Davis & Gibson: JOSA & RSI, *16*, p. 332; May 1928. T. N. B., October, 1928.

Wood Rosin

(*From p. 22*)

only grow through the profitable sales of its products. Among the achievements, the most notable is the production of an oil soluble rosin and the medium and pale grades. Included in the many factors contributing to the successful solution of the problems, particularly those involving some of the physical and chemical properties, there is one which I consider, and I believe I express the consensus of opinion of those in our Industry, has lent invaluable assistance, and that factor is the consumer, for with his close cooperation we have been permitted to enter his plants and make a thorough study of our products under actual operating conditions. In this way, we could correctly determine which property or properties were necessary for his particular conditions, and with this authentic data our Research Department could formulate a logical plan to attack the problem. As a result, we have not only been able to raise the grades of our regular products to their present high standards, but have developed special products for special uses. Through cooperative efforts both the consumer and producer share a mutual benefit and now that pale wood rosins are a reality, may your industry and the wood rosin industry join in this cooperative spirit.

Notes of the Industry

Edlund Addresses Oil Chemists

AN INCREASE of 100 per cent in its appropriation for market extension is the testimony offered by the American soap industry to the soundness of business conditions, according to a statement made by Roscoe C. Edlund, Manager of the Association of American Soap and Glycerine Producers, in an address before the recent meeting of the Oil Chemists Society at the Hotel McAlpin. His subject was "Expanding the market for Soap and Glycerine."

"The sum of $3,000,000 will be spent by the Association in the next three years in a co-operative campaign to expand the market for soaps, other cleansers, and glycerine," said Mr. Edlund. "This represents an increase of more than 100 per cent over the original appropriation made for this national educational campaign when it was inaugurated in 1927. Beginning with 1930, in addition to continuing its program of national advertising, the Association of American Soap and Glycerine Producers plans to add substantially to its support of Cleanliness Institute. This organization is cooperating with many of the leading health and educational authorities in promoting higher standards of personal and community cleanliness in the United States.

"With the backing of the soap industry, Cleanliness Institute is trying to develop, upon the soundest kind of basis, the kind of thing that educators would like to develop for cleanliness teaching. Our job is to give to the every-day ordinary subject of cleanliness, the attractive features of life and color and to make the materials available to other Educational leaders. This job is really a public service. Tens of millions of dollars are expended every year in order to teach parents the importance of cleanliness in relation to health. We must provide for health officers the kind of material the health officer would like to provide for himself. As an industry, we can, with cooperation, do that which no individual in industry can do.

"No temporary recession in our financial market can stop the progress of the country towards higher standards of living, of comfort and of health. Fundamental business conditions have never been more sound. The American soap industry does not feel that it is taking any risks in supporting our business and financial structure by increased appropriations for educational work this time.

"There are no Mississippi bubbles in soap. A soap bubble, speaking in economic terms, is one of the most solid substances known. Next to the bare necessities of food, clothing and shelter, people demand the means of keeping clean. A minimum of cleanliness is already accepted by practically all the people in this country, and experience has shown that it is possible to raise that minimum substantially through the joint educational efforts of our entire industry. These efforts will not be relaxed. Instead, we expect to double them."

British Columbia Whaling

THE whaling fleet consisting of six vessels returned from the North Pacific Ocean with a total catch of 406 whales as compared with 314 during last season. Whale operations are conducted by one company only, which reported this as one of its most successful seasons. Whales are processed at the whaling stations into oil and fertilizer. The oil is sold generally to soap manufacturers in the United States. The fertilizer also finds a market in the United States.

Hold First Chemical Day

C. C. CONCANNON, chief of the Chemical Division, Department of Commerce, has announced that so successful were the "Chemical Day" conferences held by him with various manufacturers in New York in November, that this day will become a monthly feature of the service of his division hereafter. The first "Chemical Day" was held at the New York offices of the Bureau of Foreign and Domestic Commerce at the Customs House. The entire day was spent in conferences with manufacturers in the chemical, drug and allied fields, discussing their problems. So great was the demand for time, that forty requests for appointments for conferences could not be taken care of on the first day and will be given first call at the next monthly conference which will also be in charge of Mr. Concannon. Following the recent "Chemical Day," P. C. Magnus, president of Magnus, Mabee & Reynard, Inc., New York, gave an informal luncheon to Mr. Concannon and others at the Drug & Chemical Club.

Automatic Johnson Sealer Sold

Battle Creek Bread Wrapping Machine Co., Battle Creek, Mich., has bought the Johnson Automatic Sealer Co., also of Battle Creek. For the time being, the identity of both concerns will remain unchanged, with practically the same plant and field forces maintained. With the retirement of William Bent, Freman Higgins, who has been his chief assistant for some time past, will be in charge of the Johnson organization. The Battle Creek Bread Wrapping Machinery Co. has a large national service organization, which they expect to train in connection with the Johnson machines. In addition they are now planning new packaging machinery, which will be a part of the Johnson line as soon as it is ready. Products of the Johnson Automatic Sealer Co. are top and bottom sealing machines, lining equipment, wax and glassine paper wrappers and gross and net weight scales. The Battle Creek Bread Wrapping Machine Co. makes bread wrapping and slicing machinery, special equipment for wrapping sliced bread, also equipment for wrapping yeast cakes, cartons, butter, etc. Officers of the concern are H. W. Conklin, president; W. D. Baker, vice-president; E. D. Strain, secretary, and F. G. Redner, treasurer and manager.

The publicity activities of the Mayonnaise Products Manufacturers Association during the past year have included the publication of various papers for the general public setting forth the value of mayonnaise as a food and its place in the general scheme of home economics. Some additional publicity has been directed particularly toward the operators of soda fountains and lunch rooms, where mayonnaise and mayonnaise products are important adjuncts to the sandwich and salad service. The research committee of the Association has prepared two pamphlets, one for general distribution among housewives, another, more technical in content, for the use of domestic science and other teachers and of club leaders. As a further aid to publicity, all members of the Association are urged by the publicity committee to place the official emblem of the Association on their respective business letterheads.

Exports of soya bean oil from Dairen, Manchuria to the United States for the month of October totaled 3,036,000 pounds valued at $202,000. Exports of bean cake and meal totaled 7,580,000 pounds valued at $156,000.

New Books

Inedible Animal Fats in the United States: Fats and Oils Studies of the Food Research Institute No. 3, By L. B. Zapoleon. The Food Research Institute, Stanford University, California.

The volume is the third in continuation of the series being prepared by The Food Research Institute covering fats and oils. The book covers the subjects of sources, volume, production and marketing of all forms of inedible animal by-products; sources of inedible tallows and greases, methods of rendering, the rendering industry as a whole, municipal reduction, methods of feeding waste products to hogs, and questions of public and business policy in relation to the disposal and marketing of animal waste products.

The book is well prepared and contains a wealth of statistical information not assembled elsewhere. It is illustrated with maps, charts and tables which present the important facts of the inedible animal fat business in a clear and attractive manner. It is the first volume in English treating this subject in a comprehensive manner which has come to our attention, and we believe it will prove a most valuable addition to the library of anyone interested in oils and fats. Furthermore it should be indispensable to all renderers, dealers and brokers in inedible tallows and greases.

A.P.L.

A. E. Staley Mfg. Co., Decatur, Ill., producers of corn oils, soya bean oils, and allied products, is now being represented in Western New York State by Goodman & Graves, Inc., Buffalo, N. Y.

Stocks of crude cottonseed oil on hand in United States on October 31, 1929, totaled 121,341,282 lbs., as compared with 124,624,528 lbs. on the same date in 1928. Refined oil stocks amounted to 232,699,429 lbs. on October 31, 1929, as compared with 223,045,871 lbs. held on the same date in the previous year.

A. E. Cleghorn, formerly of Long Island University Faculty, has joined the staff of Foster Dee Snell, consulting chemist, Brooklyn, New York.

Reminiscences

(*From p. 12*)

in presses such as were used for making lard oil. At the plant of the American Cotton Oil Company in Cincinnati the winter oil plant consisted of the cellars of an old wine house.

The last paragraph of the report is worthy of note. It reads as follows:

"Your committee desires to add to the above report that we find at all points of our investigation we have been continually confronted with questions requiring for their solution, careful and scientific study. In order to obtain such definite information as is necessary to carry the manufacture of the various products of the cottonseed to its highest perfection, the committee advises the establishment of a Chemical Bureau, which will be competent to cope with the many problems continually being presented."

One of the results of this report was the establishment of a laboratory at the N. K. Fairbank Company plant in Chicago.

The writer received samples of cake, meal, meats and oil from all the plants of the Cotton Oil Trust. Many of the meal samples ran as high as 18 or 20% oil. The meals ran pretty high in ammonia, as the art of incorporating the hulls had not been invented. The only test given to the hulls was the inspection for free meats. The oils were tested for free fatty acids and refining tests were made. A complaint was made to the general manager about the large amount of free fatty acid found in the oil from a certain mill. The manager replied that he had never had any free fatty acid on the place and it could not have been in his oil.

In about 1893, Henry Eckstein found out, in England, that blowing steam through refined oil would remove its odor. In conjunction with James Boyce of the N. K. Fairbank Company and with the help of the engineering department of the same company, apparatus was evolved for heating the oil very hot by means of closed steam coils and blowing the steam through the hot oil, which was afterwards cooled. The work was carried on under atmospheric pressure and was known as the Eckstein process. In 1900, the writer found that he could improve on the Eckstein process by conducting the deodorization of oil in vacuum. This was a marked improvement over the Eckstein process, and forms the basis of modern practice, each refiner working in his own manner. In addition to the use of the vacuum, various important refinements and secret details have made the so-called Wesson process maintain its pre-eminent position. In about 1908, the process of hydrogenation appeared, and what has happened since is so familiar to my readers and so recent, that it can hardly be considered historical.

Nutrition and Mayonnaise

(*From p. 23*)

The appetizing refinements in the preparation, serving and appearance of food to which many have become accustomed have developed a need for them, and they determine to a large extent the desire for food and the feeling of satisfaction that results from a meal that is relished. Has not the succulent green lettuce and bright red sliced tomato salad with its billowy puff of mayonnaise contributed to the value and pleasure of a meal and thereby established for mayonnaise a position both useful and delectable?

Mayonnaise is one of our most concentrated foods, in that it consists largely of vegetable oils and protein that are almost completely assimilated. It furnishes vitamins and minerals. What is more important is that mayonnaise encourages the consumption of those essentials in which it as well as other foods we eat may be deficient. That mayonnaise has established for itself an important position in the American dietary is shown by the size and prominence of your Association, and it will maintain and improve that position if your organization will keep abreast of the developments in our energetic nation.

ABSTRACTS

David Wesson, *Abstract Editor*

Quantitative Study of Kreis Test

IN A quantitative examination of the Kreis rancidity reaction, one drop (0.5 milligram) of a fresh aqueous 1 per cent solution of acrolein is mixed with three drops of 3 per cent hydrogen peroxide solution in a stoppered cylinder, and after three hours in darkness 5 cubic centimeters of concentrated hydrochloric acid (specific gravity 1.19) is added and the mixture shaken for one minute. After the addition of 5 cc. of a 1 per cent solution of phloroglucinol in ether a bright red color is obtained, reaching a maximum after five minutes, and if produced from 0.5 milligrams of acrolein, the color may be matched in shade by 1.2 milligrams of permanganate of potassium in 100 millilitres of water (or 3.8ml of 0.001 normal solution). In this modification of the Kreis test the acrolein is completely oxidized by the hydrogen peroxide to epihydrinaldehyde, the sensitiveness of the test being 1:100,000, and the upper detectable limit 10 milligrams of aldehyde in 100 cubic centimeters of oil. Ten year old samples of olive, soya and corn oils, two year old peanutoil, one year old lard and fourteen year old butter fat were found to contain 60, 60, 20, 100, 200 and 400 milligrams of epihydrinaldehyde per 100 grams, respectively. Since, in the extreme case, the proportion of decomposed fat corresponds with about thirteen times the amount of aldehyde found, these samples were decomposed to the extent of 0.3 to 5 per cent. *Z. Untersuch. Lebensun.* 57, 358-60 (1929).

In the analysis of green olive oils, the moisture determination is preferably conducted in water ovens heated to 100°, as discordant results may be obtained in hot air ovens due to local temperature variations within the oven. Best results are obtained in the free fatty acid determination on these oils when warm 95% alcohol is used as a vehicle for the phenolphthalein indicator. *Ind olii min. e grassi* 9, 93 (1929).

Animal or vegetable oils may be refined as follows: the oil or fat to be purified is treated with a solvent such as benzine or trichlorethylene and the mixture is subjected to the action of an aqueous alcoholic ammonia solution; the product thus formed is further mixed, (preferably while warm), with about one percent of sodium sulphate previously dissolved in ten times its quantity of aqueous alcoholic ammonia solution. The products form into layers on standing and may be readily separated. U. S. Pat. No. 1,729,809.

Wool fat extracted from crude merino wool by means of petrolic ether is said to contain small quantities of free fatty acids or alcohols and no glycerol. A sample so extracted consisted largely of the fatty acid esters of the higher aliphatic alcohols, of cholesterol and the alcohol known as isocholesterol. Negligible traces of fatty substances containing nitrogen and phosphorous were present. The fatty acids consisted of the saturated acids, cerotic, palmitic and stearic; with a trace of myristic acid. No evidence was obtained of lanopalmitic acid, lanoceric acid or the lactone of lanoceric acid. The unsaponifiable matter consisted of cholesterol, isocholesterol, cetyl alcohol and ceryl alcohol. No detectable amounts of ergosterol were found. *J. Soc. Chem. Ind.* 48, 232-8T (1929).

The following method is proposed for the detection of annatto in fats: Extract with 5 cc. of water a mixture of 50 grams of oil or melted filtered fat with 50 cc. of a mixture of equal parts of ethyl alcohol, ether and petroic ether in the presence of a little sodium bicarbonate. Filter the water-alcohol solution of the color. If the filtrate has no color, annatto is excluded. If it is yellow, corn oil, palm oil or soy bean oil pigments, or other natural or artificial colors soluble in alkaline water may be present besides annatto. With more than traces of annatto, the filter becomes slowly pinkish-orange, stronger after washing with ether. To detect traces of annatto filter the alcohol-water solution into a small crucible and dip one end of a slip of blotting paper into the solution. The solution is slowly absorbed and the immersed part and near zone of the paper becomes pink. *Ind. olii min. e grassi* 9, 73-4 (1929).

Prices

Candles, adamantine 6s 16 oz.			
20-set cases	**set.**	**.14½**	**.15¾**
40-set cases	**set.**	**.14**	**.14½**
Candles, paraffin, cs., 14 oz., case of			
40 sets	**set.**	**.10**	**.10¼**
6s 14 oz., case of six cartons containing			
36 sets	**set.**	**.11**	**.11¼**
6s 12 oz., 40 set cases	**set.**	**.09**	**.09¼**
6s 12 oz. cases of six cartons containing			
36 sets	**set.**	**.10**	**.10¼**
Patent ends	**set.**	**.17¾**	**.18**
Stearin 6s 16 oz., plain, cases	**set.**	**.16¾**	**.17**
Castor, No. 1, bbls.	**lb.**	**.13¼**	**.13½**
No. 3, bbls.	**lb.**	**.12¾**	**.13**
Chinawood, bbls. or drs.	lb.	.13½	—
Coast, tanks, spot	lb.	.12	—
Futures	lb.	.12	—
Coconut, Ceylon grade, bbls.	lb.	.08⅛	.08¼
Coast, Tanks	lb.	.06⅝	.07
Cochin grade, bbls.	lb.	.08¼	.09
Manila, bbls.	lb.	.08¼	—
Tanks, N. Y.	lb.	.07	.07⅛
Coast, tanks	lb.	.06⅝	.06⅞
Fatty acids, mill, tanks	lb.	.10¾	nom.
Cod, Newfoundland, bbls.	gal.	.59	.60
Copra, bags, coast	lb.	.04⅜	—
Corn, tanks, mills	lb.	.07⅝	.07¾
Bbls., New York	lb.	.10	nom.
Refined, bbls.	lb.	.10½	nom.
Fatty acid	lb.	.08¾	nom.
Cottonseed, crude, tanks, mills	lb.	—	nom.
P. S. Y.	lb.	.08⅜	.08⅝
Fatty acids, mill, bbls.	lb.	.09	—
Degras, domestic, bbls.	lb.	.04¼	.05½
English, bbls.	lb.	.04½	.05
German, bbls.	lb.	.03½	.04
Neutral, domestic, bbls.	lb.	.07¾	.09¼
English, bbls.	lb.	.08	.09
German, bbls.	lb.	.07	.07½
Greases, choice white, bbl. N. Y.	lb.	.06⅞	.08¾
Yellow	lb.	.06⅛	.06¼
Brown	lb.	.06	.06⅛
House	lb.	.06⅛	.06¼
Herring, coast tanks	gal.	—	nom.
Horse, bbls.	lb.	.09½	nom.
Lard, city, tierces	lb.	.11¼	—
Compound, tierces	lb.	.10¾	.11
Middle Western, tierces	lb.	.10½	—
Neutral, tierces	lb.	.12¼	—
Prime Western, tierces	lb.	.10¾	—
Lard oil, No. 1, bbls.	lb.	.11¾	—
No. 2, bbls.	lb.	.11½	—
Extra bbls.	lb.	.12½	—
No. 1, bbls.	lb.	.12	—
Winter strained, bbls.	lb.	.12¼	—
Prime, bbls.	lb.	.15	—
Linseed Oil, boiled, tanks	lb.	.1390	—
Car lots, bbls.	lb.	.1470	—
Less car lots, bbls.	lb.	.1510	—
Less than 5 bbls.	lb.	.1550	—
Double boiled, less than 5 bbls.	lb.	.1580	.1610
Raw, tanks	lb.	.1350	—
Car lots, bbls.	lb.	.1430	—
Less car lots, bbls.	lb.	.1470	—
Less than 5 bbls.	lb.	.1510	—
Refined, bbls.	lb.	.1500	.1540
Varnish grades, bbls.	lb.	.1520	.1570
Linseed cake, bags	ton	48.50	—
Meal, bags	ton	58.00	—
Menhaden, crude, tanks, Baltimore	gal.	.45	nom.
Light pressed, bbls.	gal.	.67	.70
Yellow bleached, bbls.	gal.	.69	.72
White bleached, bbls.	gal.	.72	.75
Mustard, bbls.	gal.	.85	.90
Neatsfoot, cold pressed, bbls.	lb.	.17⅝	—
Extra, bbls.	lb.	.12½	—
No. 1, bbls.	lb.	.12	—
Pure, bbls.	lb.	.14½	—
Oleo, No. 1, bbls.	lb.	.11⅞	—
No. 2, bbls	lb.	.10⅝	—
No. 3, bbls.	lb.	.10¼	—
Olive, denatured, bbls. N. Y.	gal.	.92	.95
Shipments	gal.	.90	—
Foots, bbls.	lb.	.08	—
Shipments	lb.	.07⅞	—
Edible, bbls.	lb.	2.00	2.30
Palm, Lagos, casks, spot	lb.	.07¼	.07⅜
Shipments	lb.	.07¼	—
Niger, casks, spot	lb.	.07⅛	—
Shipments	lb.	.07	—
Palm Kernel, pkgs.	lb.	.07¾	—
Tank cars	lb.	.07¼	—
Peanut, crude, bbls.	lb.	.11½	nom.
Mills, tanks	lb.	.07¾	nom.
Refined, bbls.	lb.	.13¼	nom.
Perilla, bbls.	lb.	.14	nom.
Poppy Seed, bbls.	gal.	1.70	—
Rapeseed, blown, bbls.	gal.	1.00	1.02
Refined, bbls.	lb.	.73	.74
Red Oil, distilled, bbls.	lb.	.10⅝	.11⅛
Tanks	lb.	.09¾	—
Saponified, bbls.	lb.	.10⅝	.11⅛
Tanks	lb.	.09¾	—
Salmon, coast, tanks	gal.	.44	nom.
Sardine, coast, tanks	gal.	.48	—
Sesame, refined, drums	lb.	.12½	.14
Soya Bean, blown, bbls.	lb.	.12	.13½
Crude, bbls.	lb.	.12	.12½
Orient, coast, tanks	lb.	.09½	.09¾
Sperm, bleached f.o.b., New Bedford, bbls.	gal.	.84	.85
Natural, f.o.b., New Bedford, bbls.	gal.	.78	.80
Stearic Acid, Double pressed, bags	lb.	.15¾	.16¼
Triple pressed, bags	lb.	.18¼	.18¾
Stearine oleo, bbls.	lb.	.09½	.09¾
Tallow, edible, bbls.	lb.	.08¾	.08⅞
City, extra, works, loose	lb.	.07⅝	—
Special, works, loose	lb.	.07⅜	—
Tallow oil, acidless, bbls.	lb.	.11¼	—
Tanks, N. Y.	lb.	.11	—
Vegetable tallow, coast, mats	lb.	.07⅝	—
Whale, crude, No. 1, coast, tanks	lb.	.07	—
No. 2, coast, tanks	lb.	.06½	—
Refined, winter bleached, bbls.	gal.	.80	—
Extra, bbls.	gal.	.82	—
Natural, bbls.	gal.	.78	—

Market Report on

FATS, OILS AND GREASES

(*As of December 30, 1929*)

NEW YORK—Prices of oils, fats and greases continued to decline during the period just concluded. Oleo oil, tallow oil and Niger palm oil were the only items in the list which showed even fractional advances, and about half of the remaining products were quoted lower than at the close of last period. The cottonseed oil market was quiet, with quotations on the refined oil falling lower during the month. The holiday season brought a quiet week in the exchanges at the close of the period. Demand was inactive in most of the other oils, with consequent reductions in quotations. The only factor which prevented further declines was a reduction in offerings. Corn oil and chinawood oils were all priced under the closing prices of last period as were lard, tallow, and the greases. Linseed oil also declined once more from its recent peak price. Lagos palm oil and soya bean oil were two other products which were quoted lower.

Chinawood Oil

Chinawood oil declined 1c lb. during the period as demand failed to assert itself, closing at 13½c lb. for oil in barrels or drums. It is believed that stocks in the hands of consumers are small, which would indicate that any increase in demand will have a prompt effect on prices.

Coconut Oil

No change was noted in the situation on coconut oil. Copra prices remained stationary, as did all the coconut oil prices, except on Manila coast tanks which were shaded in some quarters. Offerings were light, and demand was limited.

Corn Oil

Corn oil prices were also lower in harmony with the rest of the market. Demand was lacking, and quotations were forced ¼ to ½c lower on all varieties. Offerings from producers were light at the reduced rate.

Cottonseed Oil

Refined cottonseed oil was quoted at ⅜c lb. lower, ranging from 8⅜c to 8⅝c lb. at the close of the period as compared with 8¾c lb., inside, at the close of last period. The market was quiet, with no large volume of business being done. Quotations on crude oil were nominal, with 7⅛c lb. bid just before the close.

Grease

The grease list was again quoted lower at the close of the recent period, all items declining on the average of ⅜c lb. The market was a little firmer after the decline.

Linseed Oil

Another decline was noted in linseed oil quotations during the period, as large users held off from the market in expectation of lower prices on linseed oil which has recently been priced at an abnormally high figure. Argentine crop prospects are improving, and consumers here are anxious to check up on conditions in that market before buying high priced domestic material.

Lard

With demand quiet in both domestic and foreign markets, lard quotations were reduced on the average of ½c lb. on all items in the list except lard compound. City tierces closed at 10¼c lb.

Olive Oil

No change was noted in quotations on olive oil and foots, although an easier future market is expected.

Palm Oil

Lagos was fractionally lower in price, although Niger oil was quoted ⅛c lb. higher. Offerings were light, and demand was unimportant.

Soya Bean Oil

As competing products were quoted lower, sellers of soya bean oil were also forced to reduce their quotations. Demand was not active at the new schedule, but no further reductions were expected for the time.

Tallow

Tallow was quoted fractionally lower in a quiet market. Offerings from producers were light and demand was inactive, consumers being content to await further developments in the situation.

OIL & FAT INDUSTRIES

The Editor's Page

What Is a Chemist?

THE average employer of labor and brains, particularly an employer whose factory operations are sufficiently technical to require the services of chemical knowledge, is invited to pause long enough to give serious consideration to the nature and quality of the service which is rendered or can be rendered him by capable chemists.

Because no legal requirements have been established, any person at all may call himself a chemist and engage in the practice of "chemistry." There are probably many fakers posing as chemists today, men who are holding down their jobs through the ignorance of their employers. More plain unadulterated bunkum is dished up under the guise of chemistry than can be easily measured. Pseudo-scientists run rampant, with no curb upon their activities, except when they are given enough rope to hang themselves. This, however, is apt to prove an expensive means of obtaining their elimination, especially in a busy factory.

Many an employer has been deceived by fine-sounding polysyllabic chemical verbiage, only to discover later, to his sorrow, that he has hired a faker instead of a chemist. Employers who themselves are without chemical knowledge naturally fall easy prey to these so-called chemists. The results are frequently disastrous, particularly from the standpoint of public safety. Recommendations for procedure emanating from chemists possessing inadequate training or only superficial knowledge may and frequently do endanger the lives of employes and the safety of plant investments.

This condition has proven so detrimental to the progress of the earnest competent men who comprise the chemical profession that there have been frequent suggestions from leaders in the profession looking toward the sponsorship of legislation which would require the licensing of chemists by the various states after the manner in which doctors, dentists, lawyers pharmacists and others are now authorized to practice. The situation may be too complex to permit of such solution, but a step of the sort may eventually become necessary for the protection of employers and of sincere and qualified chemists.

Meanwhile, every employer has available a fitting test which he may apply when employing a chemist. If he desires to engage a beginner, let him require that the applicant be the holder of one or more degrees from a reputable college or university, one which has a satisfactory rating for chemical instruction. The ratings of colleges are readily obtainable from educational associations and foundations. If, on the other hand, the chemist to be employed is to be one with experience, the employer should inquire into the applicant's affiliations with Societies or Associations devoted to the study of his specialty. The faker always encounters exceeding difficulty in maintaining a position within the ranks of such groups of representative members of the profession.

A Test of Strength

THE forces which are struggling for and against increased Customs Duties on imported oils and fats, after prolonged skirmishing, engaged in a major action on the field of the Senate Floor on January 28, the outcome of the battle being decidedly in favor of the opponents of increased rates. The test of strength came in the form of a roll-call vote on an amendment proposed by Senator Thomas, (Rep.) of Idaho. Senator Thomas' proposal would have increased the duties on all oils to specific amounts which were the equivalent of 45% ad valorem, (55% in the case of linseed oil). The amendment was defeated by a vote of forty-nine to twenty-six. The Senators divided along sectional, rather than on party lines, most of the votes for the amendment coming from the agricultural regions, those against it being registered by Senators representing the industrial states. Thus we have the strange spectacle of two Democratic Senators from Georgia voting for higher tariff rates, while that High Priest of Protection, Senator Joseph R. Grundy, of Pennsylvania, voted against the increase.

The situation in the Senate in reference to duties on oils and fats was tersely and effectively described in the course of the debate by Senator Norris, (Rep.) of Nebraska, who

stated that the Senate appeared to be in "a confused state of mind" over the oil rates. To us the progress of the tariff act through the Senate offers convincing argument in favor of the adoption of the proposed system of having the import duties fixed by the Executive, rather than by the Legislative branch of Government.

At their recent Convention in Atlantic City, the Mayonnaise Products Manufacturers Association, upon the recommendation of Dan M. Gray, Chairman of the Standards and Research Committee, adopted the following resolution:

"Resolved, That the establishment of a Fellowship for practical research work, as outlined by our Standards and Research Committee, in addition to the carrying on of their own splendid work, is a good thing, and it is believed that both manufacturers and associate members, if the proposition is properly presented, will arise to the situation, and make voluntary contributions necessary to the establishment of such a Fellowship, and it is further resolved that such research work would be of inestimable value to the entire industry, and that the matter should be presented to our members in a letter from the President, accompanied by a statement from Dan M. Gray, Chairman of the Standards and Research Committee, outlining the idea."

The Florida Tung Oil Corporation, of St. Petersburg, has purchased 2500 acres of land in Hernando County for the development of tung oil plantations.

Foreign Trade Opportunities

The Bureau of Foreign and Domestic Commerce of the Department of Commerce announces that its representatives in all parts of the world have forwarded the following trade inquiries of interest to our readers. In writing the Bureau in reference to any of these inquiries please mention that you saw it in *Oil & Fat Industries.*

No.	Location	Material	Purchase or Agency
43096	Canada	Cottonseed Meal	Purchase
43055	Italy	Lard and Bacon	Agency
43098	"	" " "	"
43094	England	Oils, Fats and Greases	"
43154	Scotland	Oilcake and Meal	Purchase
43338	Germany	Lard	Purchase
43331	Chile	Cottonseed & Corn Oils	Sole Agency
43371	Dominican Republic	Lard	Agency

Statistics recently issued by the British Government on the import of lard and margarine for the first 11 months of 1929 compared with similar periods in 1928 and 1927 show a rather hopeful situation for lard. At the same time they would seem to indicate that imported margarine is not gaining the foothold in the United Kingdom that recent activity would seem to indicate. These figures are as follows:

IMPORTS

	In the first eleven months of 1929 Lbs.	1928 Lbs.	1927 Lbs.
Margarine:			
Netherlands	110,073,640	112,419,664	117,199,488
France	388,864	433,888	415,296
Irish Free State	2,183,328	1,649,308	1,650,547
Other countries	742,448	607,040	566,720
Total	113,388,280	115,109,900	119,832,051
Lard:			
From U. S.	229,559,680	214,712,960	198,544,640
Other countries	36,867,920	41,903,680	47,461,120
Lard: Imitation	7,955,480	7,217,280	8,008,000

VALUE OF IMPORTS
(Pound Sterling)

	1929	1928	1927
Margarine:			
Netherlands	2,400,574	3,277,515	3,572,246
France	11,376	13,749	13,240
Irish Free State	70,706	53,741	53,357
Other countries	24,153	17,405	15,590
Total	2,506,809	3,362,410	3,654,433
Lard:			
From U. S.	6,117,630	5,873,056	5,607,745
Other countries	994,150	1,152,941	1,363,895
Lard: Imitation	117,731	168,004	191,029

While the lard substitute trade seems to be on something of a stationary basis at a low volume, the trend of lard demand during the past three years is sharply upward.

Stocks of crude cottonseed oil on hand in United States as of Nov. 30, 1929, totaled 124,002,306 lbs., as compared with 141,906,240 lbs. held at the same time in the previous year. Stocks of refined cottonseed oil on hand on Nov. 30, 1929, totaled 326,842,959 lbs., as against 322,567,918 lbs., held on the same date in 1928.

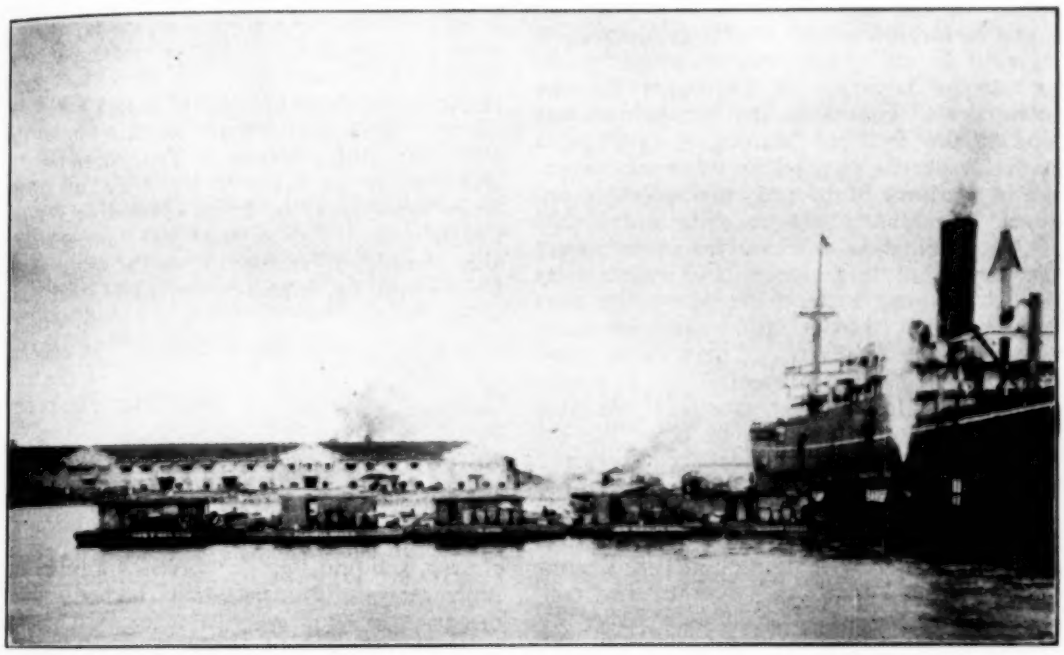
A preliminary estimate of hog numbers in New Zealand has been given out as 556,795 head according to Assistant Trade Commissioner Kunkel, Wellington, New Zealand, writing under recent date. Last year, however, there were approximately 30,000 more hogs, and the largest number of any year. The growth of hog raising is readily demonstrated by the fact that on January 31, 1916, there were only 297,501 animals which had increased to about 400,000 in 1923.

Werner G. Smith Co., Cleveland, Ohio, importers and dealers in vegetable oils, announce that V. H. Hunter, with offices in the Chanin building, New York, wha has represented them in the metropolitan district, is now their exclusive sales agent in New York City and adjacent territory.

Oil Handling Facilities at the Port of Manila

Describing the Interesting and Efficient System for Transferring Coconut Oil from Tank Lighters to Steamers

By C. W. Geiger



Loading coconut oil from tank barges into steamer's tanks near U. S. Army base at Manila, P. I.

COPRA production for export and the coconut industry in general in the Philippines had not grown to any considerable proportion prior to American Sovereignty. Practically all of the coconuts then grown were consumed locally. The exports of copra amounted to only 15,000 metric tons, valued at 1,453,000 pesos, in 1899; whereas, the exports of copra, coconut oil, copra meal and desiccated and shredded coconut products in 1927 amounted to 450,000 metric tons, valued at nearly 100,000,000 pesos. The manufacture of copra into coconut oil by modern methods was first undertaken in the Philippines in 1913. During the years immediately following, a number of large oil pressing plants and a considerable number of small ones were established. The coconut oil manufacturing industry has experienced a rather varied career due to the abnormal profits which the industry offered during the latter part of the World War, and immediately thereafter. With the return to normal levels of market prices, all of the small plants and a number of the large ones ceased to operate. Among the leading plants now in operation in the Philippines are those of Spencer Kellogg and Sons of Manila operating a plant in Manila; Philippine Refining Company, controlled by Lever Bros. of London, who have a large plant in Manila and one in Cebu, Island of Cebu; Philippine Manufacturing Company, who manufacture soap in Manila and who also refine coconut oil. Exports of coconut oil reached their maximum in 1927 when they amounted to 145,000 tons valued at 50,000,000 pesos.

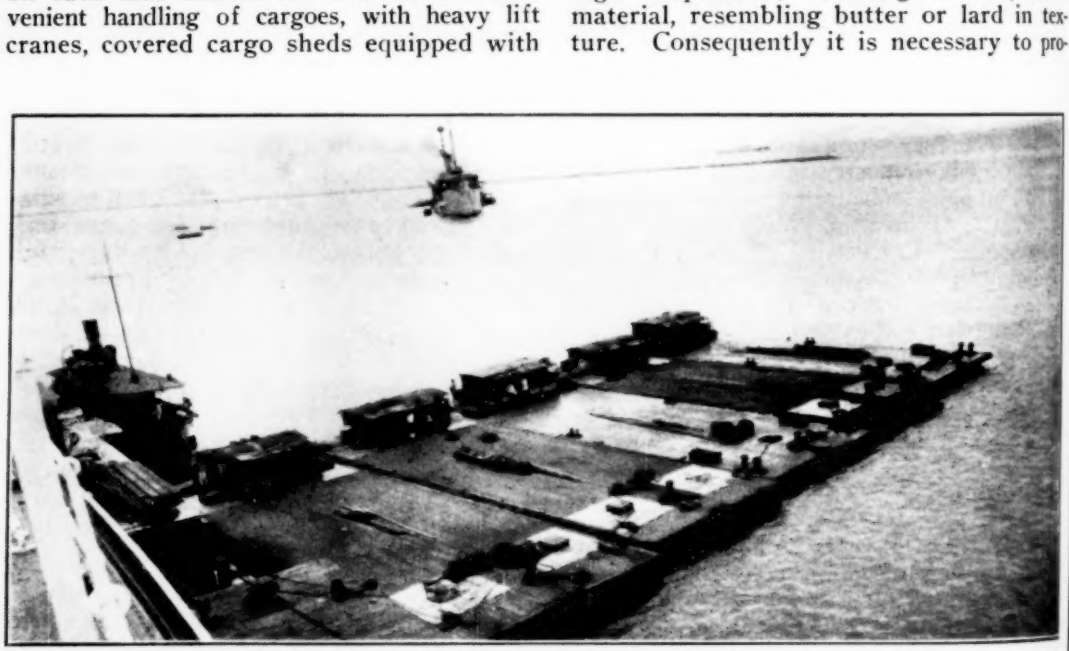
The imports of manufactured articles from the United States almost equal in value the exports of raw material from the Philippines to the United States and any disturbance of the present free trade ar-

rangement is considered likely to divert the trade which is now in American hands to European countries. German machinery importers are particularly active now and would probably be far more successful if the exportation of Philippine products to the United States should be handicapped by any duties or limitations.

The Philippine Government maintains permanent concrete piers and wharves at Manila for the accommodation of vessels engaged in foreign trade as well as for vessels engaged in the Philippine coastwise trade. No charge is made at any port for the anchorage of vessels in the harbor and, except at the Port of Manila, no charge is made for berths at piers or wharves. Towage in harbors or to and from piers is optional. At Manila, the principal entry port of the Philippine Islands, the Government has expended large sums and exerted its greatest energy toward providing the port with a good harbor and with adequate modern port facilities. There is a good deep water harbor protected by a breakwater seawall. Three excellent concrete piers and a wharf are available for the exclusive use of foreign commercial vessels. The piers and wharf have a total berthing footage of about 6,000 feet along which ten large vessels may berth at one time. Each pier is provided with wide concrete aprons on each side and at the end for the convenient handling of cargoes, with heavy lift cranes, covered cargo sheds equipped with interior traveling cranes and hoists, floor tractors and the like, Pier No. 7, the largest and newest, is the pride of Manila, and is recognized by well-informed shipping men as one of the best-constructed and equipped piers in existence today. It is built entirely of reinforced concrete and steel, 1,400 feet long and 240 feet in width. It has a cargo shed 160 feet wide extending the entire length of the pier except over a wide apron at the outer end. It is equipped with six 5 and 15 ton electric semi-portal gantry cranes mounted upon tracks on the aprons, and with twenty-three interior overhead electric traveling cranes of 2 and 3 ton capacity. A special feature of this pier is the elaborate and convenient provision for the transfer of passengers by way of upper story passenger corridors extending the entire length of the cargo shed on each side and capable of connection with ships' decks by electrically operated movable steel gang ways.

A most interesting feature of the coconut oil industry in the Philippines is the efficient and modern oil handling equipment available for handling bulk oil from the storage tanks of the mills to the cargo tanks of the steamers which carry the oil to the world's markets.

In the Philippines coconut oil is, of course, a liquid, but solidifies at a relatively high temperature, becoming a hard, dense material, resembling butter or lard in texture. Consequently it is necessary to pro-



Coconut oil tank barges loading steamer in Manila harbor near the breakwater

vide heating pipes in the steamers' tanks oil, so that the oil may be heated for pumping into storage tanks or tank cars when the steamer reaches a temperate climate. It is the usual practice to start heating the oil several days before the tank steamer arrives in port, so that the contents of the tanks will be liquid, permitting discharging operations to begin as soon after docking as possible. A low head of steam is usually turned into the heating pipes at first, this pressure being gradually increased until the oil is heated to about 100 degrees F.

Originally, coconut oil was shipped from the Philippines to San Francisco and other Pacific Coast cities in five gallon cases, but recently a new system has been perfected by means of which the oil is shipped in tank steamers and in deep tanks of passenger and cargo vessels operating between the Philippines and American ports. This practice immediately revolutionized the transportation of the commodity. For years the great trans-Pacific tank steamers had been carrying petroleum from American ports to the Orient and returning in ballast, until methods of cleaning the petroleum tanks well enough to permit carrying coconut oil on the return voyage were perfected. Now, a number of tank steamers engaged in carrying petroleum from San Francisco to the Orient, return with a capacity cargo of coconut oil stowed away in the tanks.

A very effective system is employed to thoroughly clean the steamers' tanks after the oil has been unloaded, so that the petroleum will not affect the quality of the coconut oil and vice versa. After the petroleum cargo has been discharged at the Orient, live steam is injected into the tanks over a period of from 12 to 14 hours. After pumping out the bilges, and waiting a sufficient length of time for the interior to cool, workmen are sent down into the tanks to clean them as well as possible. Later upon arrival at Manila, where the coconut oil is to be taken on, the work of cleaning the tanks is completed, this being performed by experts using special equipment. One company at Manila operates a fleet of eight coconut oil barges having a total carrying capacity of approximately 2000 tons of oil and two special barges, each equipped with two 8 inch duplex pumping outfits, each pumping outfit has capacity for pumping 100 tons an hour from the barges to the storage tanks aboard the steamers. The same company also operates a fleet of six launches for towing the barges between the coconut oil plants and steamers.

Norwegian Whaling Notes

The successful whaling season 1927-1928 led to the organization of a number of new companies this season, while several of the existing companies increased their tonnage. While last season's catching fleet consisted of 32 expeditions with 114 whaling boats, 28 floating cookeries and 6 fixed land stations, this year there are 44 expeditions with 199 whaling boats, 39 cookeries and a crew of about 9,000 men, a fleet without parallel in the history of whaling. Efforts are now being made to bring the sellers of whale oil together in order to form a ring similar to that of the buyers so as to strengthen their position. Latest reports from the Antarctic indicate that nearly all the expeditions have started operations and so far the catch has been uniformly good, with 120,000 barrels of oil reported by October 31, as compared to 65,000 barrels last year on the same date. This figure refers to Norwegian companies only. (Report from Trade Commissioner Gudrun Carlson at Oslo, Norway.)

As a result of the recent merger of Lever Bros. and Margarine Union it is found necessary to retire Lever Bros., copartnership shares which amount to a nominal value of £2,352,548, and will be exchanged for £7 per cent cumulative preference shares in the new combine. The amalgamation became effective at the start of the year under the name of Unilever, Ltd., and involves capitalization of approximately $350,000,000. The combined soap sales of Lever Bros., enterprises during the past year increased 35,494 tons, the greatest sales expansion the company has had in several years.

The new plant of the Copra Oil & Meal Co., a subsidiary of the Los Angeles Soap Co., Los Angeles, Calif., was opened recently with a barbecue and entertainment. The new plant which is located on Mormon Island cost $250,000 and will be able to handle 30,000 tons of copra annually. Its products will be completely used by the Los Angeles Soap Co., according to announcement.

Cudahy Packing Company, Chicago, reports for the year ended November 2 a net profit of $2,512,850, after all charges, compared with $2,567,327 in the previous twelve months. This is equal, after dividend requirements on the 7 per cent preferred, to $4.13 a share on 467,489 common shares, compared with $4.68 a share on 424,990 common shares in the previous twelve months.

Sardine Oil Color Standards

Methods of Grading the Several Varieties Dependent Upon Various Factors Affecting the Color Content

By P. W. Tompkins*

SINCE the advent of the sardine oil industry on the Pacific Coast, it has been the custom to designate the color as light (pale or straw), or dark, where the contract required this unstandardized grading. The terms light, pale or straw were practically synonymous and represented a wide range of light colored oils as differentiated from dark extracted oils, or oils which have become excessively dark from one cause or another. But just where the range of light color ceased and dark began was often a source of controversy. Light colored fish oils to the paint trade are different from light oils to the edible oil trade, while from the producers' point of view, anything that is not very dark or black is "light." Before considering attempts to create color standards, it must be understood that there is a great variation in the color not only between different kinds of fish oil, but also between the same kind of oil produced in different localities, and even a seasonal difference in oils from the same locality. The conditions of its rendering, regulations of the Fish & Game Commission, and other causes also influence the color.

Herring oil produced in Alaska, where whole fish is employed is quite light and considerably lighter than the average sardine oil produced in California. Pilcards, i.e., sardines caught in Canadian waters off Vancouver Island, are reduced whole for fish oil and meal, and the oil as a whole is slightly lighter than the average run of sardine oil made from a mixture of offal, trimmings and whole fish at Monterey and San Pedro, the principal points of production in California. Salmon and tuna fish oils are also different and derived mostly from trimmings as a by-product of the canning industry, tuna fish oil being almost black and salmon oil "salmon colored" to dirty brown.

The production of sardine oil at Monterey began about 1915, and at San Pedro about 1918. The former now produces about 350 cars per season, the latter about 250. The oil and meal are mostly by-products of the sardine canning industry, and present methods of preparation and handling are better than formerly, and the product more uniform and lighter in color as a whole. As production increased and sardine oil was more in demand for various uses in the the paint and varnish

Boat-loads of sardines ready for discharge at canneries

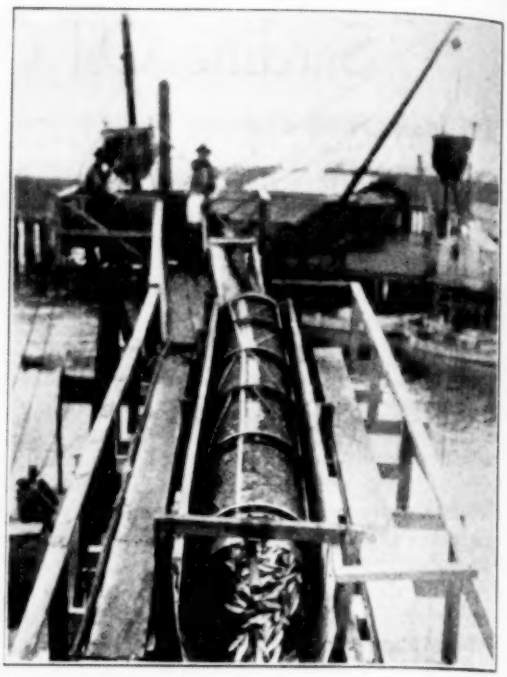
industry, for certain kinds of soap, and in increasing application for edible purposes as a refined, deodorized and hydrogenated product, the need for color standards became more apparent and controversies more frequent. Laboratories cannot create standards according to their own preference and opinions, but must pass on commodities according to standards or rules mutually adopted by the trade or associations. In the absence of such standards or rules, they attempt to report in terms of prevailing understandings, the conditions as they are supposed to exist. However, trade understandings differ according to the particular needs of those concerned, and the laboratory is usually made the "clearing house" for contentions and is often blamed for not attaining the impossible.

Existing Methods

AS A result of the general dissatisfaction with the old system of color grading of sardine oil shipped from the Pacific Coast, and hoping to help create more or less definite standards, we made specific observations extending over several years. To develop stan-

*Curtis & Tompkins, Ltd., San Francisco.

dards that would meet practical conditions of the sardine oil industry at the two points of manufacture (Monterey and San Pedro) and at the same time satisfy the requirements of all concerned was not a simple undertaking. Obviously there cannot be a separate set of standards for Monterey and another for San Pedro products, as both are sardine oils and the Eastern buyer has no way of differentiating between the two sections, yet the two localities produce oils differing widely in color characteristics due to the feeding habits of the fish. There should be one standard which everyone understands and uses, so that all will deal with a definite knowledge of what is to be expected Until the trade as a whole has accepted some basis within which it is willing to trade, no tangible result can be expected. As a result of the investigation, we are more convinced than ever, that it is not practically feasible to set any hair-splitting color standard for this oil, particularly under the conditions of its manufacture. The color is too much affected by the feeding habits of the fish, and in part by the conditions imposed by the Fish & Game Commission, which regulates the amount of material that can be used for oil and meal production. We must also anticipate a variation from season to season as well as between one plant and another.



Fish passing through revolving scaling cylinder

Unloading fish from boat to scaling cylinder

Sardine oil production has developed so fast, that producers have not all adopted standard methods and only a few have any laboratory control over their products. Furthermore, conditions in the fishing industry are so changeable that it is impossible, even with the most improved methods of production, to turn out a uniform oil. At the commencement of the season, fish, in the Monterey district, feed on a sea weed and the chlorophyll gives the oil a distinct green cast in much the same way that offal tallow has a greenish tinge, but this is not an important consideration at San Pedro. Later in the season after spawning, the oil is darker and of amber tint. When the catch is large and greater than the demands of the canning industry, some of the whole fish is used along with the trimmings, or certain amounts of fish alone may be used within the limits prescribed by the Fish and Game Commission, all of which changes the character of the oil even from the same plant. The Commission only allows about 35% of the catch being used as whole fish for oil and meal reduction, the balance (excluding trimmings) must be used for canning. On the basis of

100 tons of fresh fish the disposition would be roughly, as follows: 32.5% Whole fish allowed for oil and meal reduction, 24.0% represents trimmings and offal used for oil and meal reduction, 43.5% represents packed fish.

The technical considerations affecting the establishment of color standards may be reviewed to advantage, as conclusion should be based on a full understanding of the underlying principles which control the sardine oil industry as it practically exists, and not on the basis of an ideal situation and standard which cannot be lived up to. To better understand the foregoing, the following color extremes are given, though there are numerous intermediate shades and color ratios between them. All colors are expressed according to the Lovibond scale.

Range of San Petro Amber Oils*

Yellow	Red	Ratio
100	25.0	4 -1
70	18.0	4 -1
50	14.0	3½-1
50	12.5	4 -1
35	10.0	3½-1
35	7.0	5 -1
30	6.0	5 -1
20	5.0	4 -1

Range of Monterey Amber Oils*

Yellow	Red	Ratio
150	16.0	9 -1
150	12.0	13 -1
100	10.0	10 -1
100	8.0	12 -1
100	7.0	14 -1
100	6.0	17 -1
70	6.0	12 -1
50	5.0	10 -1

Range of Green Cast Monterey Oils*

Yellow	Red	Ratio
150	4.7	29 -1
100	4.0	25 -1
100	2.0	50 -1
80	2.0	40 -1
80	2.5	32 -1
70	3.5	20 -1
70	2.5	28 -1
60	2.0	25 -1

*All readings in 1 inch cell.

By mixing an equal proportion of each car of sardine oil examined, the following color averages were obtained and the effect of the numerous greenish oils in the Monterey blends is noticeable. Season 1926/7—Average San Pedro—50 y. 6.6 red—ratio 7½ to 1, Season 1926/7—Average Monterey—50 y. 4.8 red—ratio 10½ to 1, Season 1927/8—Average Monterey—70 y. 5.2 red—ratio 15½ to 1.

Proposed Standards

THE first idea of establishing standards naturally was to be guided by what has been used in the past for similar purposes, and in this the caramel color standards used by the Paint Manufacturers Association and the National Varnish Manufacturers Assn. appeared to be the most promising. The standards are made of caramel solutions of varying but definite color strengths in terms of yellow and red, and the varnish visually compared against these in bottles of like size and sets of these standards are sent to the trade. It was hoped that the caramel solutions could be made to serve as the basis of comparing the sardine oils, possibly in a Union Colorimeter, and by that means to classify the oils according to the standards adopted for the caramel which would act as a quick means of approximate color control for the plants. It was clearly demonstrated, however, that this method would only serve the purpose for certain types of amber oils where the ratio of yellow and red were more or less the same as those of the caramel solutions. The system was found impractical

Fish in water tanks in cutting and cleaning room, where the trimmings and offal are obtained for oil and meal

due to extreme color variations and impossibility of making any standard of this kind that would characterize all types of oils produced at Monterey and San Pedro. No standards could be prepared that would serve the purpose for both places and match the greenish as well as the amber oils.

By ordinary comparison, many of these greenish cast oils with low red appear darker than some amber oils with a higher red. For example, a greenish cast oil with 150 yellow and 4.7 red appeared darker than an amber oil of 50.0 yellow and 12.5 red when examined by reflected light. More difficulty was encountered in settling the yellow for these standards. What applied for the amber oils was unworkable for the greenish cast oils. As an attempted remedy, any set yellow was to

be omitted from the standard, and the red alone become the controlling factor. But this scheme also had the disadvantage of not properly controlling the classification of the green oils where only 2-4 red is required in matching colors. As the effort to practically use caramel standards as a means of grading Pacific Coast sardine oils as a whole was discouraging, we looked to the system originally worked by F. A. Wertz, where potassium bichromate in sulphuric acid was used as the basis of color designation of varnishes. This solution, however, has the disadvantage of not keeping very well and hence for an original or secondary standard, caramel would be better if it was usable at all for this purpose. Besides the unstable keeping quality of the chromate solution, it had the same disadvantage as the caramel of not being able to accommodate the great extremes of color.

As a further attempt in this direction, iodine in potassium iodide and water as used for color grading in British specifications for raw linseed oil was tried out, but with no more success than with the former systems. The iodine solution like the caramel and bichromate, could not be made to accommodate such a complex color range as exists. While all three methods answered the purpose for a certain range of colors, the caramel was most adaptable to amber oils around 10 red, but those of the greenish cast were entirely out of range. In other words, a caramel solution built up to 10 red (35 yellow) in a 1″ cell, would fairly correspond to the color of an amber sardine oil of 10 red (50 to 100 yellow). Sardine oils of this color range and cast could be graded fairly closely against a caramel solution of the above strength, providing the comparison was made by transmitted light as if in a colorimeter.

By various means of observation, oil colors differ greatly. Attempts at visual comparison by reflected light, of oils which had been standardized by transmitted light gave entirely unreliable results, especially when attempting to grade the greenish oils. It was found unsatisfactory to attempt comparisons by other than pure transmitted light. The thought of being able to give the producer standards with which he could simply compare his products for guidance at the plant was quite upset on this account. The experiments with artificial color standards was finally given up and as a substitute the sardine oil itself was considered for the purpose. As the caramel or other artificial standards were primarily to be based on some stated Lovibond color, it seemed only natural and more direct to apply the color limitations to the oil itself. While it was quite feasible to arrange standards in this way for the amber oils, it was just as difficult to make them fit the greenish oils as the artificial standards. This latest obstacle was to be overcome by having one set of standards for the amber oils and another for the greenish oils, but here more trouble was ahead. The trade did not want so many standards, they desired two only that would do for all oils at both points of production. One to limit the "light" or "pale" as distinguished from "medium", and a "medium" standard to differentiate between "medium" and "dark" oils.

Other phases of this investigation had to do with the preparation of the oils for observation. They contain more or less moisture and insoluble impurities and considerable stearine. The stearine deposit varies according to temperatures. How rapidly could the sample be rendered in suitable condition for observation? Should the readings be made after removing the stearine or the oil heated till the stearine went into solution and the reading then taken? Could the introduction of blue glasses be agreed upon, etc.? Many like considerations had to be reviewed, discussed and answered. Briefly it was found that the color reading was not practically affected by the removal of the stearine which was best eliminated by filtration at the ordinary room temperatures, which also removed the insoluble impurities and interfering moisture, if the moisture was not too high. In a few cases of high moisture (free water) the filtered oil, not being clear, had to be centrifuged or heated. To heat the oil before filtration to remove water darkens the oil on account of the presence of the insoluble impurities (fish meal). If the filtered oil stood too long at a lower temperature than when filtered, a further slight deposit of stearine sometimes took place. In such cases it was only necessary to warm the oil a little or refilter it when a perfectly clear liquid was again obtained for reading.

In conclusion, the whole subject has resolved itself into; how could two standards based on 8, 10, 14 or 16 red be made to control the greenish oils with only 2 to 4 red and 60 to 150 yellow, to say nothing of all the intermediate shades. Here is where the subject stands today, unanswered and little discussed. To have some definite point of distinction, any sardine oil not exceeding 14 red (yellow to match) is graded as "light", and above 14 red "dark". This custom has been followed for the past three seasons for Monterey and San Pedro products and in effect is practically what has been followed from the beginning of the industry.

Caps and Closures

Address before the Fourth Annual Convention of the Mayonnaise Products Manufacturers of America

By JULES DOMMERGUE

MAYONNAISE originated as a product made in the home, which required a great deal of time and patience in its preparation. Being a very palatable article it gained in favor to the extent where many people wished to use it, but did not have the time and patience to prepare it themselves, so it gradually developed into a manufactured product for local consumption. At this stage, not much attention was paid to the package or its closure because the product was used almost as fast as it was manufactured. As the demand increased and the manufacturers improved their production, they had to spread their distribution over an increasing area, making it necessary to transport the mayonnaise and to improve it in such manner as to make it stand up without separation for a considerable period, owing to the fact that it sometimes stood on the distributors' shelves for weeks. Not only did they have to prepare their mayonnaise in such a manner to meet this new condition, but also they had to give attention to the container and the closure.

Many different types of closures have been used in the sealing of mayonnaise, but after many years it has resolved itself into two methods of sealing, vacuum and non-vacuum. The most popular is the non-vacuum type of cap, and because the popular size jar for average house use is not consumed at one time, a cap which can be re-applied has become the most practical. Various liners have been used in caps for mayonnaise—pulp and waxed paper —pulp and oil paper—and, pulp and oil paper waxed all over.

Pulp and waxed paper is not satisfactory for the reason that the waxed paper, due to the vinegar in the product, is subject to breaking down and permits the saturation of the pulp, which eventually may cause a leak. Pulp and plain oil paper has been found to be objectionable in many instances because the oil paper may impart a foreign flavor to the mayonnaise. Pulp and oil paper waxed all over overcomes these objections, and is the one which is in general use. As a safe delivery of a product and the good name of the packer rests almost entirely upon the thin disc of paper and board, nothing but the finest raw materials should be used in cap manufacturing. That is why years of research work and thousands of dollars have been expended in development of their manufacture by the industry. Some packers are of the belief that their product would have greater keeping qualities if packed under a vacuum closure, but due to the density of the mayonnaise, which limits the degree of vacuum which can be created in the package, and due also to the fact that considerable air is beaten into the mayonnaise in its emulsification, which eventually works to the surface of the product, and to a certain extent counteracts the degree of vacuum, it is questionable whether the degree of vacuum actually obtained justifies the additional cost of a vacuum cap.

In connection with research and experimental work conducted by the cap manufacturers, there is much that does not appear to the cap buyer. Caps are made for a great variety of products covering foods, pharmaceuticals, prescription and preparatory medicines. Each product is put through an extensive test to determine the best liner available at that time. These tests extend over a period of several months and the liners are examined every thirty days. The products are subjected to tests paralleling those conditions which the product would undergo in general use. The test does not stop here; the laboratories are always searching to find a still better liner for each product, and better methods for making the liners. The Experimental Departments are working to improve the methods of manufacturing the caps, and designing automatic machines to get greater production. Speed and automatic operation involve higher class workmanship and greater accuracy. This greater accuracy has made it possible for the packer to use cap-applying machines with satisfactory results.

While standards have been set up for glass measurements, the cap manufacturer must work out his formulas for the making of a cap to fit standard glass that will take in the

(*Turn to p. 73*)

Emulsions in Theory and Practice

Reviewing Some of the Literature Relating to This Chemical Phenomenon of Paramount Interest

By JOHN E. RUTZLER, JR.

THE technical man often has use for a knowledge of emulsions, how to make them, how to avoid them, and how to use them. The theory of emulsions has not yet taken its final form; the present theoretical knowledge is fairly adequate from the view-point of the practical problems presented by emulsions.

An emulsion is a colloidal suspension in which both the continuous and disperse phase are liquids. It follows from the definition that the two liquids must be mutually immiscible, or nearly so, under the prevailing conditions in order to form an emulsion. Each phase of an emulsion is by definition a "distinct" and usually "separable" part. The majority of common emulsions contain three essential phases, viz; two mutually immiscible liquids and a peptizing, or emulsifying, agent. The peptizing agent is a substance which attaches itself to the globules of the disperse phase by absorption, by virtue of which the emulsion is formed, and more particularly, stabilized.

There are two general types of emulsions; the oil in water emulsion (oil droplets dispersed in water), and the water in oil emulsion (water droplets dispersed in oil). The terms water and oil are used here in a comparative sense. Theoretically, with the aid of the proper peptizing agent, any concentration of water dispersed in oil, or oil dispersed in water, is possible.(1)

Two classes of emulsions have been recognized, simple oil in water emulsions (no ostensible peptizing agent present), and concentrated emulsions of oil in water and water in oil. The disperse phase (oil) in the simple emulsions has not been found to exceed a concentration of 2%.(2) In the case of these emulsions, only the oil in water type has been observed.(3) The possibility that there is a peptizing agent present even in these simple emulsions is not entirely eliminated. "Stable emulsions of two pure liquids cannot be made."(4)

There are several theories of emulsion formation which can only be presented here very briefly. Bancroft (5) believes that to form a stable emulsion there must be a tough, elastic film of peptizing agent about each dispersed droplet. Further, substances which are capable of going into colloidal suspension in one of the liquids to be emulsified, and are strongly adsorbed at the liquid — liquid interface are good emulsifying agents. Holmes(4) states some of his thoughts on emulsion as follows, "Having studied cellulose nitrate as an emulsifying agent(6) —the ideal film for an emulsion must be one which forms readily and comes quickly to an equilibrium between the peptizing action of the one liquid and the precipitating action of the other. It should be tough and elastic and should change little with age. Such a film on the solvent side should be gelatinous and swollen with that liquid. On the side of the second liquid it should be coagulated, not to the point of brittleness, yet should be 'wetted' somewhat." Quincke(7) held that the main part played by an emulsifying agent is a lowering of surface tension. Fischer believes(8) that in the case of the alkali soaps the peptizing agent is the important factor. Briggs, DuCasse, and Clarke(9) present arguments counter to an hydration theory. Pickering(10) showed that it is possible that the globules of the disperse phase can be kept apart by small discreet particles of an insoluble substance. Another theory is that the best emulsifying agents have long molecules, at the end of which there is a polar group.(11) Langmuir's contention(12) is that in the case of organic liquids, the active groups are oriented towards the interior of the liquid. As a broad generality this theory may be somewhat inadequate.

It immediately becomes apparent that there is a variety of theories of the phenomenon of emulsification, some of which apply more to specific cases than as generalities. Some of the difficulty seems to have been in trying to define a good emulsifying agent; and the greater proportion of the work done so far seems to have been with stable emulsions. It is therefore not quite certain what the minimum specifications are that any given emulsifying agent must fulfill before it can be counted on to form a colloidal suspension of one liquid in another. In the majority of cases, for the

commercial handling of emulsions, the theories of Bancroft and Holmes will be found to be the most useful.

Methods for the formation and coalescence of emulsions are of particular interest to those working with fatty oils. In the process of refining vegetable oils and fats with alkali[13] one deals with both the peptization and coalescense phenomena. When sodium hydroxide solution is added to the oil, with agitation, soap is formed. The soap then peptizes the water, forming an oil in water emulsion which is fairly unstable. Heating the emulsion causes it to "break" or coalesce. It is of interest to note that while sodium and potassium soaps form emulsions of oil in water, soaps of the alkaline earth metals form emulsions of water dispersed in oil.

If one wishes to form an emulsion, there are several methods at hand. The ingredients may be stirred up with a high speed agitator, or the dispersion may be obtained by means of the colloid mill.[14][15][16] The two liquid phases may be simply shaken together in the presence of the peptizing agent. There are two ways in which this may be done by means of a shaking machine, or by hand. Intermittent shaking produces the finished emulsion in a shorter time than continuous shaking. Briggs[17] emulsified 1% sodium oleate solution in benzene, 80% of the volume being benzene. Using intermittent shaking by hand the emulsion was formed in eighty shakes; whereas it took forty eight thousand shakes to peptize the benzene by means of continuous shaking by hand. Emulsions may be formed by trituration; this method being favored by the pharmacists.[18] Here either the American or the Continental method may be used. The American method consists of peptizing the gum and placing the colloidal suspension in a mortar. The oil is then added a little at a time with continuous grinding in the same direction. The gum is ground with the oil, when using the Continental method, and enough water added at one time to emulsify all of the gum. Richards[34] has recently contributed an interesting method for the formation of emulsions. He emulsified water and benzene by means of intense, high frequency (3000 K.C.) sound waves. The sound waves acted as the means of agitation. Mercury was peptized into water by this method. Oil, in ether solution, can be peptized in alcohol by adding the ethereal solution to the alcohol in the presence of an emulsifying agent.

Emulsions may be coalesced, or "broken" by several means. In some cases by bringing the disperse phase to the isoelectric point (the breaking point), the zero value of the potential of the electric double layer[20] the emulsion may be broken. It is probable that this is what happens when an emulsion of oil and water which is peptized by sodium soap is broken by the addition of calcium chloride. Of course, the calcium chloride forms the calcium soap which wants to peptize water and oil, this antagonistic fact coalesces the dispersed droplets. Emulsions can quite often be coalesced by heating. "Anything which destroys the film (of peptizing agent) destroys the emulsion."[1] Thus a benzene in water emulsion, peptized by sodium soap, may be broken by the addition of hydrochloric acid which decomposes the soap, and by sodium chloride which "salts out" the soap. Filtration will sometimes break an emulsion, or at any rate make it much less stable. The addition of a liquid in which both phases are soluble may be used to coalesce the particles. Freezing may cause an emulsion to be broken. Electrical methods may be employed to break water in oil emulsions.[21][22][23][24] In this case high potential alternating current is generally used, although direct current will effect the desired result.

Briggs[25] has devised an excellent method for determining which phase is disperse and which continuous in a given emulsion. This method is carried out by placing a drop of emulsion on a slide under a microscope. A drop of one of the two liquid components of the emulsion is then brought up to the emulsion drop. If the emulsion and the pure drop mix, the continuous phase consists of the same material as the drop. Clayton[26] determines which phase is which by determining the electrical conductivity of the emulsion. Oil and water emulsions show a conductivity, whereas water and oil do not. Gordon and Krantz[27] add a colored foreign substance, which is soluble in only one of the phases, and observe the resulting color of the emulsion. This may have an unwanted effect upon the emulsion. Generally the Briggs method will be found most satisfactory without resorting to the more complicated methods.

Examples of a few interesting emulsions will serve to coordinate the ideas which have been discussed. Pickering[10] prepared an oil in water emulsion using basic copper sulfate to peptize a petroleum distillate (heavier than kerosene) in water. Glycerol may be dispersed in amyl acetate, using cellulose nitrate as the peptizing agent.[4] Holmes and Cameron[28] have prepared beautifully colored, "chromatic" emulsions of glycerol and benzene, using cellulose nitrate in amyl acetate. In the oil chemist's test for unsaponifiable matter by the extraction

of an alcoholic soap solution with petroleum ether, emulsions of water in petroleum ether, and petroleum ether in water, frequently coexist. Woodman[29] has investigated this phenomenon using petroleum ether with a boiling point of approximately 120°C. Mayonnaise is an oil in water emulsion (oil in vinegar) with egg yolk as the emulsifying agent. Calcium soaps probably emulsify water in oil in the process of splitting fats by the use of calcium hydroxide and superheated steam.[1] Water may be emulsified in kerosene by the use of carbon black.[30] Codliver oil is an emulsion of oil in water. Milk is an emulsion of butter fat (oil) "dispersed in a water solution of caseinogen, albumins, sugar, and various salts."[31] Rosin peptizes water in linseed oil to form paint. The resinous matter from certain oils will emulsify water and ether.[32] The emulsion is not stable due to the evaporation of the ether.

The viscosity of emulsions increases rapidly with the percentage of disperse phase; thus, very stiff emulsions containing 99% of oil as the disperse phase, in 1% sodium oleate solution, have been prepared.

The sodium salts of the low molecular weight fatty acids do not act as emulsifying agents under ordinary conditions and do not form colloidal suspensions; the sodium salts of the fatty acid series starting with lauric acid act in the reverse manner.[33]

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Combats Yellow Shortcomings

A SPECIAL rule for the consideration of the Haugen margarin bill has been granted by the House Committee on Rules, which means that this bill will not wait its turn on the legislative calendar but will be called up for action shortly. The bill, H.R. 6, was introduced by Representative Gilbert N. Haugen of Iowa, chairman of the committee on agriculture, and is similar to one reported out by this committee last year. Its purpose is to extend the oleomargarin act of 1886 to include so-called cooking compounds made in semblance of butter. Many such products are now on the market, having so far successfully resisted efforts of the Bureau of Internal Revenue to collect the tax applying to colored oleomargarin. Both butter interests and the Institute of Margarine Manufacturers have endorsed the bill.

The report submitted by Chairman Haugen states that these products are packaged like butter, resemble it closely, and are advertised as a bread spread, and are poorly suited to cooking purposes because of the deliberate addition of water, salt, and coloring matter, ingredients not found in ordinary shortening compounds. It is declared that the bill will not injure any bona fide manufacturer of oleomargarin or cooking compounds, and that it will not include unrelated products, such as ice cream, salad dressings, or puff-pastry shortenings. The bill also makes some perfecting amendments in the wording of the act, and permits the use of fish oil and fat in making oleomargarin, the committee declaring that modern refining processes make these fats edible.

Spanish Olive Oil

A further decline in prices of olive oil in Spain in the last quarter stimulated export trade, and shipments exceeded those made in the preceding quarter and in the first quarter of 1929, reaching 3,015 metric tons. Of the total exported the United States took 1,132 metric tons, or over 37 per cent, and was followed in important purchases by Italy, 504 metric tons; Great Britain, 367; Norway, 316; Cuba, 299, and Portugal, 218. In the third quarter of 1928 total exports were 5,858 metric tons, of which 3,271 went to Italy. Before prices in Spain declined sufficiently to become attractive to foreign buyers, foreign needs this year had been largely supplied by other producing countries. (*Report from Consul Brady at Malaga, Spain.*)

The Margarine Industry of Europe

By E. L. Thomas

*Specialist in Meats, Fats and Oils, in Collaboration with Field Representatives of the Bureau of Foreign and Domestic Commerce**

RECENT mergers, acquisitions by the European margarine trust, and intensive merchandising campaigns throughout Europe to increase the popularity of margarine and expand the consumer markets for the product, have accentuated interest in this industry abroad.

This article, therefore, as it embraces all of the leading margarine producing countries of Europe, is offered to fill a want and supply a service of information of particular interest to manufacturers of margarine and producers of other fats for food purposes in the United States.

THE consumption of margarine is steadily on the gain in the United States. From a volume of only 145,228,000 pounds (colored and uncolored combined) for the whole country in 1913, production had risen to 281,082,000 pounds in the first normal post-war year 1921. Last year our total production was 294,609,000 pounds and represented the largest per capita consumption on record save for the war years (1917-1919 inclusive). This brief foreword is supplied to enable the reader to make his own comparisons between the United States and the different European countries in regard to production, consumption, etc.

The trend of consumer preference toward margarine manufactured from vegetable fats, a mixture of animal and vegetable and hardened fish and whale oils is most apparent in each of the European countries where a study of the industry was undertaken. As a general proposition, statistics in the different countries make no separation of the product in accordance with its composition but the increasing consumption of vegetable fats is very conclusively shown by investigations conducted and from the ingredient schedules which in certain instances were found to be recorded in much the same manner as here in the United States.

The development of the margarine industry in Europe is reflected by the figures given in the following table. The past year has witnessed the merger of the two largest European producers. This new combine has since acquired control of numerous smaller and independent churners with the resultant economies in manufacturing and distribution costs arising from centralization of production and sales activities. All of this may be viewed as promotive of an even greater expansion of margarine production in the future despite the rapid growth of the industry in recent years.

A series of tables has been prepared and these will be found on the following pages, setting forth in as detailed a manner as possible such facts as could be assembled pointing to consumption trends. A separate section has been assigned to each country.

A brief statement at this juncture concerning the usual composition of European margarine should be in order. Vegetable oils or fats comprise a much more numerous category than those of animal origins. Hard vegetable oils such as coconut and palm kernel and soft oils including peanut oil, soya bean, cottonseed, sesame and sunflower and the more inexpensive grades of linseed oil are used together with comparatively small quantities of several of the lesser known vegetable oils. Animal fats employed embrace premierjus (oleo stock), oleo oil and stearine, edible tallow and neutral lard each playing its part in the ingredient schedules of the European industry. Hydrogenated fish and whale oils are also available since refining and deodorizing processes remove all odor and characteristic taste. The oils commonly utilized include sardine, pilchard, herring and cod oils.

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PRODUCTION OF MARGARINE IN EUROPE

(Thousands of pounds omitted)

Country	1913 Pounds	1920 Pounds	1924 Pounds	1925 Pounds	1926 Pounds	1927 Pounds	1928 Pounds
United Kingdom	[1] 188,160	(2)	[1] 358,400	(2)	(2)	(2)	[3] 448,000
Norway	60,226	72,001	94,430	97,554	94,376	95,429	(2)
Sweden	51,784	(2)	65,476	84,739	90,711	93,854	[3] 111,540
Denmark	(2)	[6] 122,796	152,680	140,440	153,120	157,960	[3] 168,300
Finland	(2)	(2)	(2)	(2)	[4] 15,432	[4] 18,519	[4] 21,826
Germany	[1] 496,035	(2)	705,472	771,610	959,001	992,070	992,070
Netherlands	194,937	[6] 218,859	288,312	291,078	296,263	339,830	(2)
Belgium	[5] 26,400	50,600	51,700	59,400	61,600	79,200	89,100
France	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Spain	(2)	(2)	(2)	(2)	(2)	(2)	(2)

1. Estimate but closely approximate.
2. Production statistics for this year not available.
3. Preliminary.
4. Unofficial.
5. Statistics for 1914.
6. Statistics for 1921.

NOTE: Values have been omitted because of the impossibility of securing such data for the majority of the countries.

Great Britain

THE growing scarcity and rising cost of animal fats led to the steady substitution of vegetable oils in the years immediately preceding the Great War. During the war period this transition was greatly accelerated by the acute scarcity of animal fats and a consumer preference coincident with the improvement in manufacturing processes. Prior to the war animal fat margarine led in popularity in the ratio of seven to three. These proportions are now reversed but the ascendancy of vegetable oils as the principal fat component of margarine is threatened by the introduction into the edible field of hardened whale and fish oils which are relatively cheaper in cost than vegetable fats. Especially does this hold true with respect to the lower priced brands of margarines but inasmuch as margarine churners are not required by law as in the United States to make returns to the government on the nature and quantity of the various ingredients entering into their product, such information cannot be furnished.

Margarine is employed very largely as a butter substitute for table use but to an increasing extent is entering into cooking such as frying and as a shortening in baking. In Great Britain the industry is dominated and controlled by the Margarine Union since its recent merger with Lever Brothers, which does not become fully effective until January 1, 1930.

It might be stated, too, that margarine in Europe is beginning to supplant lard to an increasing extent especially in those countries where it is the common household custom to use lard in place of butter as a spread for bread.

Germany

THE largest consumer of margarine in point of volume is Germany and the industry is self sustaining as evidenced by the unimportant exports and imports of this country. Margarine of foreign origin is excluded by a duty of 20 marks per 100 kilos ($.0217 per lb.). In the past about 60% of the German production was manufactured in the Rhine Provinces, chiefly the cities of Cleve and Goch with other plants at Emmerich, Duisburg, Neuss, Krefeld and Cologne in the same province. It is probable that such a large fraction of the industry was localized in this province because of excellent transportation facilities afforded with the port of Rotterdam for the import of raw materials and the advantage of being nearby industrial centers. The close proximity to dairy districts may likewise be reckoned as a factor influencing the establishment of such a large number of plants.

As in the case of Great Britain and most of the other European countries of which more will be said in following sections, the Margarine Union has acquired many of the factories formerly independent. This has made the lot of the remaining producers a rather unhappy one as they find it increasingly difficult to compete with the combine which has closed many of the smaller plants it has taken over in order to concentrate production and curtail overhead making possible in this way the introduction of latest approved manufacturing methods. The ramifications of the Margarine Union are many and embrace in addition to churneries, soap factories, oil seed crushing mills and refineries, hydrogenation plants and sources

of raw material. In short every step in the chain of production from the raw material to the finished product can be dictated by the Union. Incidentally it might be added that oilseeds are admitted into Germany free of duty while animal fats are taxed (neutral lard and oleo oil $.0065 per lb. and premier jus $.0076 per lb.).

TABLE II
GREAT BRITAIN*
(Thousands of pounds omitted)

Year	Production	Exports	Imports	Net for Consumption	Per Capita Consumption Lbs.
1913	188,160 [1]	—	170,049	358,209	7.76
1924	358,400 [1]	—	147,319	495,719	11.77
1925	[2]	—	155,331	—	—
1926	[2]	—	149,347	—	—
1927	[2]	—	133,745	—	—
1928	448,000 [1]	—	123,512	571,512	13.28

* Including England, Scotland and Wales.
NOTE: Exports from United Kingdom have always been negligible and have therefore been disregarded in the foregoing tabulation.

TABLE III
GERMANY
(Thousands of pounds omitted)

Year	Production	Exports	Imports	Net for Consumption	Per Capita Consumption Lbs.
1913	495,035 [1]	—	—	—	7.93
1922	992,070 [1]	—	—	—	15.87
1923	661,380 [1]	—	—	—	10.36
1924	705,472 [1]	—	—	—	11.02
1925	771,610 [1]	—	—	—	12.35
1926	959,001 [1]	—	—	—	15.43
1927	992,070 [1]	1,993	273.	—	15.87
1928	992,070 [1]	3,181	234.	—	15.87

* Includes artificial butter.
[1] Estimate but closely approximate.

TABLE IV
DENMARK
(Thousands of pounds omitted)

Year	Production	Exports	Imports	Net for Consumption	Per Capita Consumption Lbs.
1921	122,796	—	—	—	35.27
1922	123,237	—	—	—	34.61
1923	143,294	—	—	—	43.55
1924	152,999	—	—	—	43.65
1925	154,763	—	—	—	44.09
1926	153,440	—	—	—	44.09
1927	158,290	—	—	—	45.19
1928	168,300 [1]	—	—	—	—

NOTE: Exports and imports omitted because insignificant.

Sweden

ANOTHER country where the manufacture of margarine is essentially a domestic industry is Sweden. Fourteen factories were in operation in 1927 which in comparison with many of the European countries is indicative of a high per unit output. The industry is growing fast, several of the fourteen factories mentioned having been operating but a few years and while per capita consumption data are lacking for the past four years, it is approximately correct to state that per capita consumption has more than doubled in this short time and may be expected to increase still further.

The Margarine Union now controls four of the Swedish margarine factories three of them numbered among the largest in Sweden and one of which manufactures nothing but vegetable margarine. However, although all of the remaining thirteen plants manufacture both animal and vegetable fat products not more than 5 to 10% is the former article at the present time and there are no mixed type products produced except for a vegetable margarine into which is churned either whale oil or butter. Coconut oil, peanut oil and highly refined soya bean oil, listed in the order of their importance are the vegetable oils employed to the greatest extent. American refined cottonseed oil has not been able to compete with these oils and consequently the importation of it has been much reduced of late years.

France

THE lack of production statistics and consumption data make it impossible to do more than hazard an estimate of the probable development of margarine manufacturing in France. A conservative estimate would place production at the present time around 66 million pounds. The vegetable fat product and mixed vegetable and animal types alone are manufactured, but this statement originates with unofficial sources and may not be entirely accurate. The Margarine Union is a dominating factor in the French industry and practically controls it.

Exports of margarine in 1926 were 12,667,190 pounds; in 1927, 16,967,042 and last year, 15,262,445 pounds. The strictly vegetable fat product represented 60% of all exports in 1926 and was a slightly higher percentage or 63% last year. France imported in 1920, 7¼ million pounds of margarine largely from the Netherlands and to a far lesser extent from Belgium. Imports in 1920 were one hundred fold greater than during 1913 but were over 2½ times again as large in 1924 and still greater or very nearly 25 million pounds in 1927. In this last year the excess of imports over exports was therefore about 10 million pounds.

Per capita consumption in 1913 was only .88 pound and it had increased to but 1.54 in 1924. France has the lowest consumption per capita of all the European countries possessing a margarine industry of any prominence. Vegetable margarine to which cream has been added is finding increasing favor with the consuming public because it resembles natural butter the more closely in taste. On the other hand manufacturers of pastry, pies, biscuits, etc. show a preference for the mixed vegetable and animal fat article.

(To be continued)

Increased Oil Tariffs Defeated in First Real Test

Senate, by Vote of Forty-nine to Twenty-six, Defeats Amendment Proposing to Raise Oil and Fat Rates

LATE in the afternoon of January 28, the United States Senate voted on two last-minute amendments offered for the purpose of effecting further substantial increases in the tariff rates on all classes of animal and vegetable fats. The votes resulted in the decisive defeat of both amendments.

The first proposal considered, which was introduced by Senator Jones (Rep.) of Washington, was originally intended to increase the tariff on all oils imported to a uniform rate of 45 percent ad valorem. Before the amendment reached a vote, however, Senator Jones voluntarily modified it in such a way that it contemplated only an advance in the rates on sod, herring and menhaden oils from five to fifteen cents per gallon. This amendment, when put to a vote, was defeated *viva voce*.

The second amendment, offered by Senator Thomas, (Rep.) of Idaho, proposed to increase the rates on all imported oils by a specific amount in each case. Some examples of the rates proposed in the Thomas Amendment are as follows:

Castor oil—5c per lb.
Linseed oil—4½c per pound or a minimum of 55% ad valorem.
Palm oil—3.1c per lb.
Perilla oil—4.6c per lb.
Sweet almond oil—3.4c per lb.

The last three of these oils are admitted free of duty at the present time.

Senator Sheppard, (Dem.) of Texas, opened the debate in favor of increased duties on vegetable oils, asking for specific duties equal to 45% ad valorem and 40% on the oil content of oil-bearing seeds and beans and copra. According to Senator Sheppard, the demand for the increased tariffs is advanced by the producers of cottonseed, flaxseed, corn, hogs, beef, soya beans, peanuts and milk, representing more than six million farmers. Senator Norris, (Rep.) of Nebraska stated that the Senators seemed to be in a confused state of mind over the oil rates and Senator Smoot, (Rep.) of Utah, chairman of the Senate Committee on Finance, agreed.

Senator Copeland, (Dem.) of New York, opposed the amendments on the ground that many of the imported oils are used in the manufacture of soap, and that the cost of cleanliness should not be increased to the American Public, including the farmers.

A roll-call vote was taken on the Thomas amendment, and resulted in the decisive defeat of the amendment by a vote of forty-nine against the amendment to tweny-six in favor with twenty-one not voting or paired. The leaders of the opposition to the tariff schedules as now written in the bill, state that they plan a fight for reconsideration of oil and other agricultural duties when the bill comes before the Senate for individual amendments. The leaders of the Senate hope to secure final passage of the Tariff Act by February 15.

For Tariff on Manila Oil

A PROTECTIVE tariff on imported coconut oil was demanded in a resolution adopted at the meeting of the Texas Cottonseed Crushers' Association in Dallas, Texas. The resolution, which was presented to the thirty-seven members of the association, representing 168 mills in Texas, explained that American cottonseed oil could not compete in price with the Philippine coconut oil produced by cheap labor. The prediction was freely made at the meeting that within five years an amount of coconut oil equal to the total cottonseed oil output of the United States would be produced in the Philippine Islands. Only 2 percent of arable land in the islands is under cultivation, it was said, and about 80 percent is government land.

The resolution, which specified besides the oil the copra from which it is produced, declared that the situation had brought about "for the Southern cotton oil and other domestic fat industries destructive and impossible competition to the extent that all fats are near the pre-war price level and at least 30 percent below the average price level of all other commodities." The present price of cottonseed oil averages 7 cents a pound, as against the five-year immediate pre-war average of 6 cents, it was stated, causing an unusual amount of seed

(*Turn to p.* 73)

Notes of the Industry

Peanuts in the Philippines

IT has been demonstrated that peanuts can be grown successfully in a large area of the Islands, according to Assistant Trade Commissioner Rohrer, Manila, Philippine Islands, in a comprehensive report to the Bureau of Foreign and Domestic Commerce. The high quality of the Philippine peanuts is such as to indicate that a very satisfactory market for them, for confectionery purposes, could be found in the United States, provided the nut is properly cured. Experience has shown that the Chinese seed is more adaptable to conditions than seed imported from the United States, but the greatest difficulty that the Philippine growers have had to surmount has been the proper curing of the nut. Manila exporters are now lending a hand in the promotion of educational propaganda to teach the native growers the requirements of the market in the United States. It is believed that this improvement will assist greatly in making Philippine peanuts more popular. Aside from a market in the United States, a domestic crop from the Philippines would insure independence of China, from which country the Islands are now importing peanuts and peanut oil to a value of approximately half a million pesos ($250,000) annually.

Plan Renderers' Combine

DILLON, READ and COMPANY, investment bankers, of New York City, are engaged in the formation of a large merger of rendering plants, located in strategic cities throughout the country. It is expected that the new rendering company will eventually control in the neighborhood of sixty percent of all the independent rendering of shop fats and other collected materials in the country, and that the gross volume of business will produce profits exceeding two millions of dollars annually. As nuclei for the merger, large rendering establishments in Pittsburgh, Richmond, Columbus, Youngstown, Cleveland, New York, Chicago and other cities have been selected, and negotiations for their acquisition are progressing rapidly.

Armour & Co. Earnings

The net earnings of Armour & Co., Chicago, in the fiscal year ended November 2, 1929, amounted to $9,810,518, after all charges, according to the company's annual report issued January 7. This is equivalent, after preferred dividends, to 40 cents a share on the 2,000,000 shares of Class A common stock. Total surplus of the company showed an increase of $350,553 to $47,138,668.

The company reduced its funded debt of $2,208,100 and retired $648,700 of the preferred stock of Armour & Co. of Delaware.

Vol-U-Meter and Bruno Merge

The Bruno Manufacturing Company, of Buffalo, long established maker of can and bottle filling machinery, is now joined with the Vol-U-Meter Company, Inc., manufacturer of filling, cleaning and agitating equipment for steel drums and barrels. The merged companies will operate under the name of Vol-U-Meter Company, Inc., with Raymond D. Stevens in charge of sales and Joseph C. Bruno in charge of manufacturing operations. General offices will be at 710 Ohio Street, Buffalo, N. Y. The line now offered consists of the Bruno Float Feed Can Filling Machine, Bruno Multiple Vacuum Bottle Filler, Old Faithful Drum and Barrel Agitating and Cleaning Equipment, Vol-U-Meter Drum and Can Filling Equipment, Drum and Barrel Inspection Lamp and other items that make a complete line of filling, agitating and cleaning equipment.

The Laboratory Construction Company, Kansas City, Missouri, report the following recent installations of their Nitrogen Apparatus and Laboratory Equipment Tables: Salina Board of Trade, Salina, Kansas; Wilson Flour Mills, Wilson, Kansas; Eastern Cotton Oil Co., Norfolk, Virginia; Tennessee Chemical & Copper Co., Lockland, Ohio; Pillsbury Flour Mills Co., Springfield, Illinois; Pillsbury Flour Mills Co., Buffalo, New York; National Biscuit Co., Toledo, Ohio; Ralston Purina Co., Denver, Colorado; State of Alabama, Auburn, Alabama.

David Wesson has been elected Councillor-at-Large of the American Chemical Society.

Vogt Processes, Inc., of Louisville, Kentucky, are marketing a new type of machine for the intimate mixing and simultaneous chilling, congealing or freezing of materials. It is claimed that this machine, known as the Votator, will accomplish the purposes for which it is intended continuously, in one process, faster and at less cost than any other machine; that it is the only process machine of its type which operates under pressure and is automatically controlled. The machine is said to be particularly adaptable to the manufacture of shortenings, margarines and other emulsified oil-containing products.

The annual dinner of the Oil Trades Association of Philadelphia was held in the Marlboro-Blenheim Hotel, Atlantic City, January 22. About 150 members and guests attended. The Oil Trades Association of New York was represented by A. J. Saunders and E. H. Laing.

The Schreiber Products Corporation of Buffalo, New York, has contributed $500.00 to the Fellowship Fund of the Mayonnaise Products Manufacturers Association.

Glidden Company sales for the fiscal year beginning November 1, show an increase of $2,376,442 over the previous corresponding period and an increase of $454,093 for the first two weeks of 1930.

The Federal Trade Commission has issued an order directing the discontinuance of anti-sweet advertising on the part of certain manufacturers of cigarettes. This action is the result of protests filed by the Food Products Protective Committee, which represented practically all manufacturers of food products in the country.

The assets and business of the Pittsburgh Provision Co., of Pittsburgh, Pa., have been purchased by Armour and Co.

New Books

Analyse der Fette und Wachse. Zwtiter Band Systematik Analysenergebuisse Bibliographic der natürlichen Fette und Wachse (Analysis of Fats and Waxes, Vol. 2, Analytical Data and Bibliography of Natural Fats and Waxes). By Adolf Grün and Wilhelm Halden, Julius Springer, Berlin, 806 pages 18 x 25.5 cm., not illustrated. Price, bound, R.M. 98.

This is the second volume of the work and follows Volume I by A. Grün, published in 1925. Volume I is devoted to methods for the examination of fats, waxes, and products manufactured or derived from them. The present Volume II is devoted to selected data for some 1050 fats and 280 waxes. The evident aim of the authors to present authoritative information and data covering every fat and wax known to science appears to have been attained. No omissions have been detected. If any exist they are of minor importance and not of such a character as to impair the value of the work as a comprehensive compilation of present knowledge of the physical and chemical characteristics of the fats and waxes. The book is divided into three main sections, Part I comprising 522 pages and giving the characteristics and composition of fats and oils of animal and vegetable origin; Part II, 66 pages, comprising similar data for waxes; and Part III, 182 pages, devoted to a bibliography of approximately 6,000 references. A very complete subject index, also indices of botanical and zoological names is provided.

The section devoted to fats is divided into those of vegetable and animal origin, and the vegetable fats are in turn subdivided into drying and non-drying fats. This is a departure from the common practice of making the division into three classes, drying, semi-drying, and non-drying. In making the division, all oils which exhibit any drying properties whatever are classed as drying oils. This necessarily results in the inclusion of a number of oils of very feeble drying properties in that class. Waxes are divided according to origin into vegetable, animal, and mineral or fossil waxes. Within each division the various fats and waxes are arranged in accordance with the botanical or zoological classification of the plant or animal from which derived. The bibliography is extensive and comprehensive, comprising some 6,000 citations. Arrangement of the citations follows the arrangement of the body of the work. The book is an outstanding example of the bookmaker's art and is singularly free from typographical and technical faults. On account of its completeness, together with its systematic arrangement, comprehensive bibliography, and excellent index, this book is a particularly valuable work of reference.

Robert H. Kerr

(*From p. 59*)

tolerance necessary in glass making. These formulas differ with different cap manufacturers, due partly to the type of equipment used. The cap manufacturer not only has to contend with the tolerance required by the glass manufacturer, but the metal he uses is not obtainable in uniform guage and temper. A cap to meet all conditions must be so constructed as to be pliable enough to conform to minor variations in the glass finish and still rigid enough to have the required strength to make a secure seal. All the materials going into the manufacture of caps must be checked against specifications for quality, guage and measurements, because variations cause trouble in manufacturing and also may cause trouble in the user's plant.

Many cap manufacturers maintain service departments not only to advise the packer as to the proper handling of the caps, but to assist in any of his packing problems. Should there be any trouble because of glass and cap fit, this is referred through regular channels, and handled in such a manner as to give the packer as little to worry about as possible. While some cap manufacturers still buy on the outside much of the material which they use, others not only have their own litho and liner departments, but compound their own rubber and make their own lacquer, varnish and inks, so as to control as many of their processes as is possible, although in some instances it is more expensive to do so.

All of the foregoing is with the thought in mind of producing high quality, accuracy and uniformity in an article which when received by the packer permits him to get high production with a minimum of trouble. The packers of mayonnaise putting up a high quality product, can ill afford to buy anything less than the best to be obtained in closures, so as to insure their product getting to the consumer in the best condition. It also behooves them to buy their closures from a reliable source, to get the best results.

Tariff

(*From p. 69*)

to be taken back to the farms for feed and a corresponding decrease of seed reaching the mills. The resolution also commented that the coconut industry in the Philippines belongs largely to foreign interests, the native labor receiving 18c. to 20c. in direct competition with the Southern farmer. The resolution asked that the tariff rate applied to the Philippines be set at 25 percent in the crushers' favor, or that imports of coconut oil be limited to 300,000,000 pounds annually.

According to figures reported to the United States Bureau of Internal Revenue by margarin manufacturers, production in November, 1929, compared with the output in November, 1928, as follows:

	Pounds	
	1929	1928
Uncolored oleomargarin	31,708,818	29,126,253
Colored oleomargarin	1,728,074	1,442,957

Walter O. Hastings, formerly Secretary of Marden, Orth and Hastings, and well known in the oil trade, died at his home in Braintree, Massachusetts, on January 1, after a protracted illness.

Armour & Co., which assumed $15,000,000 of Morris & Co.'s 7½ percent gold notes when it took over that company's packing business, will pay off the notes when they become due in September. Sinking fund provisions will then have reduced the original amount to $9,500,000. Payment will be made out of Armour & Co. surplus, which is $47,138,668.

ABSTRACTS

David Wesson, *Abstract Editor*

Method for Unsaponified Fat

The following method is offered for the determination of unsaponified fat in soaps: dissolve a five to ten gram sample in an Erlenmeyer flask at 50° in 80 cc. alcohol and 70 cc. water in which 1 gram of sodium bicarbonate is dissolved, to neutralize any free sodium hydroxide. Cool to room temperature, extract three times in a separatory funnel with 700 cc. petrolic ether (30-50°) and shake with 15 cc. 0.1 Normal soda and 15 cc. alcohol, then three times with 50% alcohol. Filter through ignited sodium sulphate into a weighed Erlenmeyer flask, evaporate dry at 100° and weigh the residue of free fatty acids, unsaponifiable matter and unsaponified fat. Dissolve in 20 cc. neutral alcohol and titrate with 0.1 Normal sodium hydroxide for free fatty acids; add 1-2 cc. ten Normal potassium hydroxide and saponify under reflux for one-half hour. Add 18 cc. water, cool and shake three times with 30 cc. petrolic ether; wash with 10 cc. of 50% alcohol three times and filter, dry and weigh as before, obtaining the unsaponifiable matter. Subtract the free acids plus unsaponifiable from the total residue to find the unsaponified fat. *Seifensieder-Ztg.* 56, 245-6 (1929).

Rosin may be converted into alpha-abietic acid by treatment with oxalic acid at 140-160°. The alpha-abietic acid is then combined with an unsaturated acid of the oleic series such as oleic acid by treating an equimolecular mixture of the two with a catalyst such as zinc chloride at 160-200°. The entire process may be carried out on the rosin dissolved in the fatty oil and the proportions may be adjusted to the quantities desired for the production of soap later on. The resulting products may be converted into soaps which are claimed to be entirely stable even with a 40% rosin content and which contain 4% more water than a normal soap. Fr. Pat. No. 665,425.

It is claimed that the keeping qualities and aroma of butter and margarine are improved by the addition of alkaline lactates which have been purified by the elimination of volatile acids and other impurities such as iron. Brit. Pat. No. 308,405.

Kaufmann's thiocyanate number for linseed oil is shown to represent a sharply defined addition of the thiocyanogen group to certain unsaturated fatty acids. By calculation from results obtained from all forms of addition products and elimination of those contrary to facts, it is shown that one molecule of linolenic acid adds two molecules of thiocyanogen and oleic and linolic acids add one only each. *Z. angew. Chem.* 42, 73-76 (1929) *Chemical Abstracts* 24, 253 (1930)

Fats having the same fatty acids may differ in the constitution of the glycerides. With a mixture of alcohol and acetone a solid fat can be divided into a liquid and a solid part. The index of refraction, iodine number and Crismer number (demixing temperature of the fat and aniline) can be determined on the two parts and the fats thus be identified as to their origin. *Rec. trav. chim.* 48, 1058-60 (1920).

In extraction analysis of spent bleaching earths, complete extraction is impossible on account of adsorption of oil by the earth or charcoal, so that the result should be reported in such manner as to designate the solvent used. High test gasolene is the preferred solvent, being said to extract the least amount of impurities along with the oil. When the earth is fresh and the extraction properly conducted with a preferred solvent the extracted oil is as light as or lighter than the original oil and is free from any traces of the bleaching earth.

In an investigation of the film properties of China wood oil a dried film was stored between glass plates in the absence of light, for a period exceeding two years. After the expiration of fifteen months the granular particles and drops of liquid were noted in the film. After a period of twelve months more small crystals were noted in the liquid portion of the film. These crystals are believed to consist of beta-eleostearine. *Farben-Ztg.* 34, 2941-2 (1929).

Prices

Candles, adamantine 6s 16 oz.			
20-set cases	**set.**	**.14½**	**.15¾**
40-set cases	**set.**	**.14**	**.14½**
Candles, paraffin, cs., 14 oz., case of			
40 sets	**set.**	**.10**	**.10¼**
6s 14 oz., case of six cartons containing			
36 sets	**set.**	**.11**	**.11¼**
6s 12 oz., 40 set cases	**set.**	**.09**	**.09¼**
6s 12 oz. cases of six cartons containing			
36 sets	**set.**	**.10**	**.10¼**
Patent ends	**set.**	**.17¾**	**.18**
Stearin 6s 16 oz., plain, cases	**set.**	**.16¾**	**.17**
Castor, No. 1, bbls.	**lb.**	**.13¼**	**.13½**
No. 3, bbls.	**lb.**	**.12¾**	**.13**
Chinawood, bbls. or drs.	lb.	.12½	.12¾
Coast, tanks, spot	lb.	.10½	.10¾
Futures	lb.	.10½	.10¾
Coconut, Ceylon grade, bbls.	lb.	.08	.08¼
Coast, Tanks, Domestic White	lb.	.06¾	.06⅞
Cochin grade, bbls.	lb.	.08½	.08¾
Manila, bbls.	lb.	.08	.08¼
Tanks, N. Y.	lb.	.07⅛	.07¼
Fatty acids, mill, tanks	lb.	.10¾	nom.
Cod, Newfoundland, bbls.	gal.	.56	.64
Copra, bags, coast	**lb.**	**.04⅜**	**—**
Corn, tanks, mills	lb.	.07⅞	.08
Bbls., New York	lb.	.10	nom.
Refined, bbls.	lb.	.12½	nom.
Fatty acid	lb.	.08¾	nom.
Cottonseed, crude, tanks, mills	lb.	.07½	nom.
P. S. Y.	lb.	.08⅜	.08⅝
Fatty acids, mill, bbls.	lb.	.09¼	—
Degras, domestic, bbls.	**lb.**	**.04¼**	**.05½**
English, bbls.	lb.	.04½	.05
German, bbls.	lb.	.03½	.04
Neutral, domestic, bbls.	**lb.**	**.07¾**	**.09½**
English, bbls.	**lb.**	**.08**	**.09**
German, bbls.	**lb.**	**.07**	**.07½**
Greases, choice white, bbl. N. Y.	lb.	.07	.08¾
Yellow	lb.	.06¼	.06⅜
Brown	lb.	.06⅛	.06¼
House	lb.	.06¼	.06⅜
Herring, coast tanks	gal.	—	nom.
Horse, bbls.	lb.	.09½	nom.
Lard, city, tierces	lb.	.10¼	—
Compound, tierces	lb.	.10½	.10¾
Middle Western, tierces	lb.	.10⅞	—
Neutral, tierces	lb.	.12	—
Prime Western, tierces	lb.	.11	—
Lard oil, No. 1, bbls.	lb.	.10½	—
No. 2, bbls.	lb.	.10¼	—
Extra bbls.	lb.	.12	—
No. 1, bbls.	lb.	.11	—
Winter strained, bbls.	lb.	.12¼	—
Prime, bbls.	lb.	.13½	—
Linseed Oil, boiled, tanks	lb.	.1360	—
Car lots, bbls.	lb.	.1440	—
Less car lots, bbls.	lb.	.1480	—
Less than 5 bbls.	lb.	.1520	—
Double boiled, less than 5 bbls.	lb.	.1550	.1530
Raw, tanks	lb.	.1320	—
Car lots, bbls.	lb.	.1400	—
Less car lots, bbls.	lb.	.1440	—
Less than 5 bbls.	lb.	.1480	—
Refined, bbls.	lb.	.1470	.1510
Varnish grades, bbls.	lb.	.1490	.1530
Linseed cake, bags	ton	41.50	—
Meal, bags	ton	49.50	—
Menhaden, crude, tanks, Baltimore	gal.	.43	.45
Light pressed, bbls.	gal.	.64	.66
Yellow bleached, bbls.	gal.	.66	.68
White bleached, bbls.	gal.	.69	.71
Mustard, bbls.	gal.	.90	—
Neatsfoot, cold pressed, bbls.	lb.	.17⅝	—
Extra, bbls.	lb.	.11⅛	—
No. 1, bbls.	lb.	.10⅝	—
Pure, bbls.	lb.	.13⅛	—
Oleo, No. 1, bbls.	lb.	.12¼	—
No. 2, bbls	lb.	.10⅞	—
Olive, denatured, bbls. N. Y.	gal.	.92	.95
Shipments	gal.	.90	—
Foots, bbls.	lb.	.08	nom.
Shipments	lb.	.07⅞	—
Edible, bbls.	lb.	2.00	2.40
Palm, Lagos, casks, spot	lb.	.07⅝	.07¾
Shipments	lb.	.07⅜	—
Niger, casks, spot	lb.	.07⅛	—
Shipments	lb.	.06⅞	.07
Palm Kernel, pkgs.	lb.	.07¾	—
Tank cars	lb.	.07¼	—
Peanut, crude, bbls.	lb.	.09¼	.09¾
Mills, tanks	lb.	.07¼	—
Refined, bbls.	lb.	.12½	.13
Perilla, bbl.	lb.	.13	nom.
Poppy Seed, bbls.	gal.	1.70	—
Rapeseed, blown, bbls.	gal.	.90	.92
Refined, bbls.	lb.	.72	.73
Red Oil, distilled, bbls.	lb.	.10⅛	.10⅝
Tanks	lb.	.09¼	—
Saponified, bbls.	lb.	.10⅛	.10⅜
Tanks	lb.	.09¼	—
Salmon, coast, tanks	gal.	.44	nom.
Sardine, coast, tanks	gal.	.42½	—
Sesame, refined, drums	lb.	.10½	.11
Soya Bean, blown, bbls.	lb.	.12	.13½
Crude, bbls.	lb.	.12	.12½
Orient, coast, tanks	lb.	.09½	.09¾
Sperm, bleached f.o.b., New Bedford,			
bbls.	**gal.**	**.84**	**.85**
Natural, f.o.b., New Bedford, bbls.	**gal.**	**.78**	**.80**
Stearic Acid, Double pressed, bags	lb.	.14½	.15
Triple pressed, bags	lb.	.16½	.17
Stearine oleo, bbls.	lb.	.09⅛	.09¼
Tallow, edible, bbls.	lb.	.08¾	.08⅞
City, extra, works, loose	lb.	.07½	—
Special, works, loose	lb.	.07¼	—
Tallow oil, acidless, bbls.	lb.	.10½	—
Tanks, N. Y.	lb.	.10¼	—
Vegetable tallow, coast, mats	lb.	.06⅞	.07
Whale, crude, No. 1, coast, tanks	**lb.**	**.07**	**—**
No. 2, coast, tanks	**lb.**	**.06½**	**—**
Refined, winter bleached, bbls.	**gal.**	**.80**	**—**
Extra, bbls.	**gal.**	**.82**	**—**
Natural, bbls.	gal.	.78	—

Market Report on

FATS, OILS AND GREASES

(*As of January 27, 1930*)

NEW YORK—The trend of prices for oils, fats and greases continued downward throughout the recent period. Changes in quotations were very numerous, and almost all of these represented revisions to lower levels. Buyers are in good position, with large stocks on hand, and meet any tendency to advance quotations by withdrawing from the market. This situation, which has persisted for a number of months, is considered accountable for the continued downward movement of fat and oil prices. Chinawood oil was quoted substantially lower during the period, reaching a new low level for the present decline. Coconut oil was shaded in price, with corn oil priced fractionally higher. Cottonseed oil was unchanged in price from last period, with a quiet market prevailing. Linseed oil declined again, as did neatsfoot oil, tallow oil, peanut oil, rapeseed oil and a number of others. The greases showed a slight advance in price, while movement of lard prices was irregular. Stearic acid and red oil both declined due to cheaper raw material.

Chinawood Oil

Disturbance in the Chinese exchange was responsible for a considerable drop in the price of this oil. Futures were quoted at 10½c lb., inside, 1½c lb. under the closing price at the end of last period. Total importations during 1929 amounted to 119,677,718 lbs., as compared to 107,356,971 lbs. in 1928.

Coconut Oil

The market for coconut oil was quiet during the recent period, changes in quotations being confined within narrow limits. At the close of the period most quotations were fractionally lower.

Corn Oil

With light offerings from suppliers corn oil prices advanced slightly in one of the few upward movements of any consequence during the period. Mill tanks were quoted at 7⅞c to 8c lb. at the close.

Cottonseed Oil

The cottonseed oil market was comparatively quiet during the recent period, with a smaller amount of trading than has characterized the market in recent months. On January 23 the report of the Census Bureau was given, reporting the amount of cotton ginned up to January 16 as 14,187,779 bales, against 13,888,972 bales up to the same date last year.

Fish Oils

Menhaden declined 3c gal. on the refined grades, with the crude oil 2c lb. lower. Sardine was priced 6c gal. lower. It was learned that the European margarine trust had bought up the season catch of whale oil at £25 per ton for No. 1 oil, as compared with the price of £30 which prevailed last year. The catch so far this season is about double the amount taken last season.

Grease

The severe decline of recent months was finally checked, and grease quotations advanced ⅛c lb. on all grades, during the recent period. House and yellow grease were quoted at 6¼ to 6⅜c lb.

Linseed Oil

Linseed oil continued to decline during the recent month until just before the close when a firmer condition was noted. It is reported that an effort will be made to increase the domestic flax acreage during the coming season, as it seems that this crop will be more profitable then it has been previously.

Lard

Middle Western and prime Western tierces advanced during the period just closed, while lard compound and neutral tierces were shaded in price. Extremely cold weather in the West was the cause of the two advances, although weather conditions did not materially cut down receipts.

Red Oil and Stearic Acid

As the raw material declined in price again, stearic acid and red oil quotations were also lowered once more. The former declined about 1½c lb. for double and triple pressed, while red oil was priced ½c lb. lower for saponified or distilled oil.

OIL & FAT INDUSTRIES

The Editor's Page

Butter vs Margarine

AS WE go to press, the country is in the midst of a situation without precedent in recent history. The best creamery butter can be purchased at retail in chain stores for thirty-four cents a pound, even in metropolitan centers. The dairy interests have raised their usual cry, that they cannot sell their production because of the competition of margarine. They overlook entirely the fact that the general index of all commodity prices has fallen markedly during the year just past, and is continuing to decline. All through the course of this decline, the creamery interests have been storing butter in large quantities, with the purpose of artificially maintaining higher prices, and with the hope that the trend would reverse and permit them to increase their profits. The trend, however, has failed to bend to their will, and they find themselves facing the coming season of large butter production with the largest carryover stocks on hand of any similar time during recent years.

Of necessity, then, they must dispose of these stocks at what they will bring, to make room in the cold stores for the incoming production. How convenient it is for them to seize the occasion for an attack on their ancient ogre, the margarine manufacturer, and lay all their troubles at his door.

He, on the other hand, goes steadily on his way, producing a clean, wholesome, nutritious foodstuff, of products which are either grown on American farms or refined in American factories by American workmen. His output is distributed to the consumer promptly after manufacture, at a price based on current prices of his raw materials, unaffected by market speculation in his commodity. No enormous stocks of margarine can be discerned reposing in cold storage awaiting market advances for disposition. The manufacture of margarine is conducted in the cleanest type of manufacturing establishments in the country, under the constant supervision of the Department of Agriculture and the Bureau of Internal Revenue, as well as that of the Sanitary Officers of the various states.

It is not to be wondered at, then, that the production and sale of margarine in this country is growing steadily and surely, solely on the merits of the product, in spite of the restrictive legislation, the unfair attacks and the vituperation of those whose special interest lies in attempting to deprive the American public of the right to purchase this wholesome food.

Juggling Credit

Credit established through ratings published by the commercial reporting agencies is quite frequently abused. This is particularly true in the case of firms which buy to the limit from one raw material house, stall off paying their bills for four to five months, then, when the seller becomes reluctant to grant them further accommodations, switch to another source of supply of the same raw materials, with whom they repeat the same tactics. In each case the purchases are made possible through the tacit approval of a credit agency which furnishes reports of the buyer's financial rating in published or other form. These conditions indicate that credit rating is not always a true criterion of credit risk. Many firms with little or no rating are better credit risks than some of the larger ones whose ratings in the credit books run to five or six figures.

Where and when competition for business is keen, which is equivalent to saying almost everywhere and all the time, unscrupulous buyers are repeatedly playing one competitor against another for the purpose of obtaining more and more material on credit. If one seller cuts off a buyer because old bills are unpaid, the threat to turn to his competitor for materials is frequently used by the buyer as a means of coercing him. Sometimes it makes him hesitate in pressing his demands for payment, although, for all he may know, he himself may have been the threat used to victimize a previous supplier.

Misery loves company, and some folks enjoy sitting by to watch a competitor go over the same rough road which they have just traveled themselves. It is this policy which makes this form of credit juggling possible. When a questionable buyer threatens to switch over to Bill Jones, your competitor, because you press him too hard for past due bills, the sensible thing to do is to notify Jones of the true facts in the case and then let him take the business if he wants it. Let the other fellow know that this buyer is not honest. Publicity is the greatest enemy of this type of fraud, which thrives on secrecy. Last, but not least, when a new big customer comes to you find out why he has switched from your competitor. A frank exchange of facts can do a lot to eliminate this particular form of "credit jumping."

1929 Margarine Production

NEW JERSEY ranked third among the states of the Union in the production of margarine last year, according to figures just made public by Dr. J. S. Abbott, secretary of the Institute of Margarine Manufacturers.

"New Jersey's margarine output was 32,123,016 pounds in 1929," said Dr. Abbott, "or about one-tenth of Uncle Sam's entire margarine production which amounted to 333,121,016 pounds. Illinois led the states in margarine production last year with a total of 152,099,550 pounds. California was second with an output of 37,332,982 pounds and Ohio fourth with 31,161,528 pounds. Then came Kansas with 20,258,240 pounds, Missouri with 11,246,611 pounds, Maryland with 9,022,434 pounds, Wisconsin with 8,570,657 pounds, and Michigan with 4,564,070 pounds. The remaining production was accounted for by Colorado, Florida, Indiana, Louisiana, Massachusetts, Nebraska, Oregon, Rhode Island, Tennessee, Texas and Washington."

America's margarine consumption showed an increase of 13 per cent over the year previous, Dr. Abbott pointed out, and was due to the growing tendency of families in the United States to budget their table expenses and whittle down the family food bill by using margarine. From a dollars and cents standpoint, it is shown, the margarine industry is important to farmers both in the cattle and dairy sections, as well as to those who raise cotton and peanuts. The total financial return to farmers from the sale of their products for the manufacture of margarine runs into millions of dollars a year.

Trade Code Criticised

In Congress recently, Representatives Patman of Texas and Brand of Georgia requested an investigation by the House of Representatives of the alleged "cottonseed oil trust." Charging Edward A. McCulloch, former Chairman of the Federal Trade Commission, with neglect of duty and malfeasance in office, Mr. Patman said there are from 4,000,000 to 6,000,000 tons of cottonseed raised annually, and that the farmers as the result of a trade practice conspiracy to keep down the prices are being deprived of from $8 to $15 a ton on their cottonseed. He gave figures and statements on which he based a declaration that as a result of the "conspiracy" in violation of the law the purchasing power of the farmers of the cottonseed producing states is being reduced from $50,000,000 to $75,000,000, or more annually.

The code of trade practices which was adopted at the Memphis meeting has been regarded throughout the industry as one of the most carefully prepared of the earlier codes, and one which had been subjected to every type of government suggestion, in order that it might be fair to all concerned and improve not only the condition of the industry itself but that of the producers of its raw material.

The Chickasha Cotton Oil Company reports for the six months ended Dec. 31 net profit of $448,121 after depreciation and taxes, etc.

Foreign Trade Opportunities

The Bureau of Foreign and Domestic Commerce of the Department of Commerce announces thaat its representatives in all parts of the world have forwarded the following trade inquiries of interest to our readers. In writing the Bureau in reference to any of these inquiries please mention that you saw it in *Oil & Fat Industries.*

No.	Location	Material	Purchase or Agency
43497	France	Lard	Agency
43561	Germany	Lard, tallow	Agency
43538	Switzerland	Cottonseed oil	Agency
43481	Scotland	Cottonseed oil	Purchase
43477	Cuba	Corn and bean oil	Agency
45566	Portugal	Oleomargarine	Agency
43478	Cuba	Oleomargarine materials	Purchase
43621	Germany	Lard	Agency
43750	Austria	Castor, coconut, fish oils, animal fats.	Purchase
43752	Germany	Tallow and bone grease	Purchase

The Brazilian Babassu

Tropical Forests Natural Storehouses for Great Quantities of High Quality Oil

By Alan Porter Lee*

OF the many and varied natural resources of Brazil, none is so inadequately exploited or presents such glowing prospects of rich rewards from industrial commercialization as the babassu nut palm (*Attalea Funifera, Familia Cocoineoe*). The babassu palm grows in abundance over a large portion of the vast area of Brazil. The kernel of the babassu nut yields an oil which has been adjudged at least equal to coconut oil for most of the purposes for which the latter is employed. The babassu kernels have been in considerable demand in Europe during recent years and every shipment finds a ready market. The total of nuts exported from Brazil in 1927, however, was less than 26,000 metric tons. The great difficulty facing the babassu industry is the extraction of the kernels from the husks in commercially profitable quantities, sufficient to insure steady and ample supplies for export.

Babassu enthusiasts maintain that the major potential wealth of the nut lies in the husk, rather than in the kernel. It is claimed that the husk will yield on distillation many valuable chemical substances, leaving a residue of metallurgical coke of superior quality.

Much has been written and many prognostications made, yet industrial exploitation of the babassu nut is still in its infancy, and although hundreds of thousands of dollars have been expended in its development, the industry is still struggling for its initial success.

History and Extent

THE babassu nut first attracted world attention in 1914, when due to the shortage of coal incident to the World War, entire nuts were utilized as fuel in the boilers of Brazilian steamships. The nut had been used, however, by the natives in northern Brazil from the earliest days of their tribal recollection. The rubber workers of the Amazon valley have used it (together with the urucury nut), as fuel for the smoking of rubber. The use of whole nuts as fuel is now prohibited by state and federal decrees. It is said that the smoke fumes serve as an excellent disinfectant for the destruction of animal life encountered in the rubber latex. The forest and plain dwellers of the north have for some time extracted the oil from the kernels for purposes of illumination. The husks have been used for fuel in the modest iron foundries in northern Brazil. Moreover, there has also existed a considerable commerce in babassu nuts, both whole and broken, as fuel. It is only since 1914, however, that the babassu nut has figured in Brazilian exports.

Babassu palms are found in the Brazilian states of Amazonas, Para, Maranhao, Piauhy,

Babassu palm on river bank

*Based on information furnished by The Foodstuffs Division, Bureau of Foreign and Domestic Commerce.

Ceara, Bahia, Espirito, Santo, Sao Paulo, Minas Geraes, Goyas and Matto Grosso. This palm is possibly found also in the states of Pernambuco and Rio de Janeiro under the name of pindoba, or indaya. Exploitation of the palm has been carried on principally in Maranhao and to a less extent in Piauhy. An American expedition into Piauhy some years ago estimated the number of babassu palms in that state alone at 400,000,000. The total in Brazil would thus probably run well into the billions of trees.

Babassu growth occurs in Brazil mainly in two forms, the one "palmeiral" and the other in virgin forest. The former is a dense growth almost exclusively of babassu on land that has formerly been cleared. Only the palms that gain access to light and air bear fruit under these conditions. Exploitation of such growth requires cutting out the inferior trees. The growth in the virgin forest is not so dense and the babassu is interdispersed with other varieties of trees.

Commercial Uses

THE utilization of the kernels both at home and abroad for the production of oil constitutes the chief commercial use of the babassu at present. The oil greatly resembles coconut oil, and is useful in the manufacture of vegetable margarines, shortening, chocolate fats, soap, shampoos, and other toilet preparations, light lubricants, etc., in fact, wherever coconut oil is employed. Babassu oil has been employed to a small extent in Brazil for the operation of Deisel engines, but its use for such a purpose is an obvious extravagance. The press-cake remaining after the expression of the oil is a superior cattle feedstuff, equal in all respects to copra cake. An analysis of the oil as reported by the Imperial Institute of London is given below:

Babassu palm with ripe nut clusters

Typical cluster of babassu nuts

Melting point (open tube)	26°C.
Solidification point	23°C.
Specific gravity at 100°/15°	0.868
Acid number	5.5
Saponification number	249
Iodine number	15.6
Unsaponifiable matter	0.3%
Soluble volatile acids	5.8%
Insoluble volatile acids	10.2%

The babassu kernels are exported principally from the port of Sao Luiz, Maranhao, and the nearby island of Cajueiro. During 1927 there was exported from Brazil to a total of 25,977 metric tons of babassu kernels valued at 24,000 contos of reis. (*A conto of reis is equivalent to* 1000 *milreis: at present rates of exchange* 1 *milreis is equal to approximately* 12 *cents.*) During the first ten months of 1928, total exports amounted to 18,191 metric tons valued at 19,519 contos of reis. This would indicate a substantial rise in the export values

of the babassu kernel in 1928 as compared with previous years.

The bulk of the exportation in recent years has been conducted by four firms, two of which are Brazilian, one Brazilian-German and one German. The exporting firms have staffs of buyers all through the interior of Maranhao and Piauhy, principally along the railway between Sao Luiz and Therzina and along the Itapicury and Parahyba rivers. Competition

Natives extracting babassu kernels by hand methods

is keen and the buyers seek out the natives, or caboclos, in their dwellings. The latter never need take the initiative in order to sell their hoards of kernels. The transportation of the merchandise to the seaport is handled entirely by the buyer.

Extraction of the Kernels

THE babassu industry to date has been carried on almost entirely in the native manner. As the nuts fall when ripe, the caboclo has only to gather them from the ground. To extract the kernels he breaks open the nuts with an axe or mallet. The procedure is as follows: holding the axe between his feet, the native places the nut on the blade of the axe, then strikes down sharply with a stick of wood, driving the nut onto the axe blade.

There have been many and various types of machines for cracking the babassu nut placed on the market, but there are very few in actual use on an industrial scale. The machine must be of rugged construction, in order to obviate delays in production due to breakdowns. It must be, in addition, of such design that the kernels are not injured in the cracking of the shell. To date no machine has been developed into successful commercial operation, but one American inventor has developed

Anvil and knives of babassu nut cracking machine

a machine which gives the greatest promise of commercial success. This machine has been demonstrated in Para and has excited the most favorable comment from Brazilians who are acquainted with the requirements of a successful babassu cracking machine. The demonstration machine has been sold to the federal experimental station. Another of the same design is installed in Sao Luiz. The machine splits the nuts on radial planes into eight cuneiform sections. The central column is cored away from the kernel cell walls with the object of reducing to a minimum any crushing or cutting of the kernels, thus retaining the original oil content in the kernels and insuring maximum kernel recovery. Illustrations of this machine are shown herewith.

(*Turn to Page* 107)

The Margarine Industry of Europe

By E. L. Thomas

*Specialist in Meats, Fats and Oils, in Collaboration with Field Representatives of the Bureau of Foreign and Domestic Commerce**

RECENT mergers, acquisitions by the European margarine trust, and intensive merchandising campaigns throughout Europe to increase the popularity of margarine and expand the consumer markets for the product, have accentuated interest in this industry abroad.

This article, therefore, as it embraces all of the leading margarine producing countries of Europe, is offered to fill a want and supply a service of information of particular interest to manufacturers of margarine and producers of other fats for food purposes in the United States.

PART II

Denmark

THE high per capita consumption of margarine in Denmark—the highest, in fact, of the whole world has an extremely simple explanation. The butter produced in Denmark is of such a uniformly high quality that Danish producers are able to command a premium market abroad for practically the entire output of the dairies. The natural consequence has been the development of a margarine industry to supply a substitute fat for the butter exported. The accompanying table shows the degree to which margarine has supplanted butter. Denmark supplies essentially its entire requirements in margarine and neither exports nor imports to any extent.

Last year there were 130 margarine factories with 1,300 workers in the country. This is a marked increase in recent years since there were but 50 manufacturing establishments in 1918. However, the extension of the control of the Margarine Union which has already taken over a number of Danish plants is expected to result in a centralization of production and the consequent closing of some of the factory units now in operation. As a matter of fact even at the present 10 factories account for 85% of the total production of margarine.

Animal fats represented but 17% of the raw materials entering into the manufacture of margarine in 1927 but this is, however, a substantial increase from 7½% in 1921 and may be attributed almost entirely to the increasing consumption of hydrogenated whale and fish oils. In 1921 official records show no fats of this description being utilized in the margarine industry whereas 10.6% of the 17% total previously quoted were hardened whale and fish oils in 1927. Just as is the case elsewhere in Europe, Danish manufacturers have discovered that the improvement in the technique of hydrogenation made such fats available for edible purposes.

Of the vegetable oils entering into margarine cocoanut oil has always been the predominating favorite, this oil alone accounting for 60% of all raw material requirements in 1921. Since that year, though, it has yielded somewhat to an increasing use of other vegetable oils. There has been a decided fluctuation in the consumption of cottonseed oil no doubt to large extent due to price movements.

Netherlands

THE headquarters of the Margarine Union is in the Netherlands where the margarine industry is largely under its domination. One might expect therefore a reduction in plant operations. This does not seem to have been the case, however, for there were only three fewer plants in operation in 1926 than 1922, and only sixteen factories in all of the Netherlands in the latter year. The number of employees has increased in this four year period from 4,186 persons to 4,988. Netherlanders eat very nearly as much margarine as butter but the production is much

*Published by permission of the Bureau.

in excess of requirements at home so considerably more is exported than is retained for domestic consumption. About 70% of this export surplus is sent to England and the balance shipped all over the world. The penetration of other countries by the Margarine Union suggests the possibility of a decline in exports because of a concentration of manufacturing activities in those countries that may now be importing.

Producers in the Netherlands report a definite and well-established preference for vegetable fat produce. This is borne out by the trend in supplies of raw materials. Whereas in 1923, 40% of all raw materials required by the industry was animal fat, this percentage shrank to 20% in 1927. The more popular of the vegetable oils are peanut, soya bean and coconut with an increasing quantity of linseed in later years. The decline in the use of animal fats is the more marked when it is stated that hardened whale and pilchard oils, both classed as animal fats, have found an expanding outlet in margarine manufacture. The increasing employment of vegetable oil has brought about lower prices on margarine which in turn has tended to further popularize its consumption. However there would appear to be a likelihood of a general advance in wholesale prices in the early future applicable only to standard brands. This is not expected to affect retail prices for a time at any rate.

Norway

THE industry of margarine churning supports forty Norwegian factories at the present time. Its growth appears to have been arrested at least temporarily for while production was greater in 1927 than preceding years, factory output in each year was somewhat less than during 1925, the high mark in production to date.

Although Norway imports more margarine than is exported (see Table VI), the imports are intended largely for re-export so Norway may be regarded as self-contained in respect to supplying her needs in this food commodity. The consumption of margarine in Norway is second only to Denmark from a per capita standpoint but it is to be doubted whether more margarine can be consumed in Norway except as the population increases for the maximum annual per capita consumption of butter and margarine combined is placed at 46.3 pounds while present individual consumption is 13¼ to 15¼ pounds of butter and 33 to 35¼ pounds of margarine annually. The official per capita consumption of the latter article was reported as 34.3 pounds in 1927.

Some very striking shifts in the ingredient requirements of the industry took place during the years between 1916 and 1927. The greatest change occurred in the case of animal fats, i.e., oleostock, oleo oil and neutral lard. From 31% in 1916 the percentage of this type of fats dropped to but 10½% in 1927. In part this was made up for by the increasing use of hydrogenated whale and herring oils. In 1916 no fats of this description were employed whereas in 1927 the consumption was 9% of the total of all raw materials. Two grades have been found desirable by the Norwegians. One has a melting point of 42° and the other 52°. More and more are vegetable oils gaining favor. Their more extensive utilization is attested by the fact that vegetable oils represented 39% of all ingredients in 1916 and 56.6% in 1927. Aside from the element of price which favors the vegetable oil group of fats, such oils have high moisture absorption qualities which makes them preferable to animal fats. Milk including cream and butter declined from 22% in 1916 to 19% in 1927 despite a 25% increase in margarine production volume during this period of eleven years. This is evidence that other fats have replaced milk to the extent of about 8½% in margarine formulae. Churners in Norway at the present are using nearly twice as much cocoanut and other similar so-called hard vegetable oils as they use of cottonseed and soyabean oils.

The statement has already been made that vegetable oils average to cost the manufacturer less than animal fats. In Norway the higher priced animal fats have placed such margarines on a retail price level approaching butter which has been another factor influencing the sale of the article. The lower-priced vegetable fat product has not been hampered by such competition and therefore appeals to popular demand.

Belgium

FOURTEEN plants are in operation at the present time, some of them being subsidiaries of large producers. Very few manufacturers are independent of the Margarine Union which as in many other European countries has acquired most of the larger producers. Production statistics are not available but consumption in 1914 was nearly 26½ million pounds. In 1920 it had almost doubled but showed no further gain until 1925 when it was reported to have been 59½ million pounds.

From 1925 consumption reflects a steady growth, last year reaching 89 million pounds. Inasmuch as per capita consumption in 1913 was 3.32 pounds and in 1924, 7.42 pounds with a total consumption of slightly under 52 million pounds it may be assumed with due allowance for growth in population the past five years that per capita consumption last year was around 11½ pounds—substantial progress in the development of the industry.

Much of this increased consumption may be attributed, no doubt to what amounts to a complete substitution of animal fats by vegetable oils as the principal constituent raw materials employed by the Belgian industry. This has brought about a general lowering of the price of the commodity and is asserted to have resulted in a superior article being offered the public. The vegetable oils most commonly utilized are cocoanut, peanut, soya bean and sesame.

Belgium has a foreign trade in margarine the balance of which has been on the import side since 1923. Previous to that year the annual trade was of larger proportions and aggregated 14 million pounds in 1920 (about one-third imports and two-thirds exports). In 1922 it was less the total being 1,744,925 pounds and about 40% imports to 60% exports. Since the pendulum of trade swung the other way in 1923, Belgium's excess of imports over exports was 256,000 pounds in that year and 855,000 the following year, mainly from the Netherlands. From 1925 to date Belgium's foreign trade in margarine has been insignificant and chiefly confined to Netherlands for imports, France furnishing the principal market for the exports.

Spain

THE industry is not extensive in Spain due principally to the widespread use of olive oil in this country. Very little margarine manufactured in Spain is other than an animal fat product chiefly for the reason just stated. Production and consumption statistics are not available but it can be said that consumption is relatively unimportant.

TABLE V
NETHERLANDS
(Thousands of pounds omitted)

Year	Production	Exports	Domestic Consumption	Per capita consumption Pounds
1913	194,937	151,646	—	—
1921	218,859	152,691	95,316	12.79
1924	288,312	208,057	113,810	15.43
1925	291,078	200,453	119,666	16.31
1926	295,263	206,472	122,316	16.31
1927	339,830	203,806	136,024	17.86
1928	(1)	195,755	—	—

NOTE: The totals of the exports and domestic consumption in each year exceed production. It may be assumed that certain quantities intended for domestic consumption were for some reason diverted into export trade.
1. Estimate but closely approximate.

TABLE VI
NORWAY

	Production	Imports & re-exports	Exports	Estimated Consumption	Pounds Per capita Consumption
1913	60,226	79	1,319	59,113	24.03
1920	72,001	2,193	150	74,194	28.22
1924	94,430	3,022	303	97,347	35.49
1925	97,554	1,500	319	98,940	35.71
1926	94,376	705	354	94,924	34.17
1927	95,429	593	315	95,907	34.30

TABLE VII
SWEDEN
(Thousands of pounds omitted)

	Production	Imports	Exports	Net Consumption	Pounds Per capita Consumption
1913	51,784	810	36	52,558	9.92
1922	38,849	1,451	422	39,878	—
1923	51,397	2,797	48	54,146	—
1924	65,476	3,993	10	69,450	12.27
1925	84,739	3,873	417	88,195	—
1926	90,711	3,019	470	93,260	—
1927	93,854	3,778	206	97,426	—
1928	111,540	(2)	72	111,468[7]	—

2. Not available.
7. Imports not included.

To be continued.

World Trade in Soy Beans

By Felix T. Pope

Foodstuffs Division, U. S. Dept. of Commerce

OWING to the many new uses that are constantly being found for vegetable oils and the ever-increasing popularity of oil cake and meal as a stock feed, oilseeds are year by year assuming a more important place in world trade. World production for the year 1926 approximated 35,900,000 short tons, of which about one-third was exported from the country where it was grown, either in the form of seed or as oil and oil cake and meal. Cottonseed is by far the most important of all oilseeds, world production in 1926 having been nearly 14,000,000 short tons, or about 40 per cent of the total production of all oilseeds. Other oilseeds in the order of their relative importance are sesame seed, flaxseed, and soy beans (peanuts not being considered, as a comparatively small proportion of them are crushed). Soy beans are of Asiatic origin and have been raised in China for many centuries. That country is still the chief source of supply and they play an important part in China's foreign trade. Manchuria is the great producing area, supplying about 40 per cent of China's total crop.

In Asiatic countries—especially China and Japan — the soy bean is largely used as a human food, being second only to rice in its importance as a food crop. Exports of soy beans and their by-products from China during 1925 were 5,824,296,000 pounds; in 1926, 6,877,302,000 pounds; in 1927, 7,576,493,000 pounds.

Production of Soy Beans in the U. S.

THE soy bean was introduced into the United States as early as 1804 and for several decades was regarded more as a botanical curiosity than as a plant of economic importance. With the introduction from Asiatic countries of new varieties into the United States, the soy bean has assumed great importance and offers far-reaching possibilities to the future agriculture of this country. A short ton of soy beans (33½ bushels) produces about 240 pounds of oil when crushed and 1,620 pounds of cake or meal, the remaining 140 pounds being invisible waste, mostly moisture thrown off in the process of manufacturing. Soy beans bring the highest price for seed and for food purposes, and least for crushing, so that with the limited supply of home-grown beans available, it is only after other demands are met that mills are able to buy. In spite of this, cotton-oil mills are active in promoting the growth of soy beans, as it gives them an opportunity to use their plants for longer seasons than they can depending entirely on cottonseed, the same machinery being used without additional equipment being required.

Soy beans were first used for the production of oil and meal in the United States in 1910, imported seed being used. American-grown seeds were first used in 1915 by cottonseed-oil mills in North Carolina, according to Dr. W. J. Morse, of the United States Department of Agriculture. The production in this country has increased rapidly in recent years. While no accurate figures are available back of 1924, it is estimated that in 1917 only about 1,000,000 bushels were produced for seed. In 1924 production had increased to 5,190,000 bushels, the succeeding years being as follows: 1925, 5,131,000 bushels; 1926, 6,063,000 bushels; 1927, 7,925,000 bushels; 1928 (estimated), 8,052,000 bushels. (These figures do not include soy beans grown as a forage crop.)

The increase has been the most marked in the State of Illinois, production in that State having increased from 30,000 bushels in 1919 to 1,750,000 bushels in 1926, and 2,650,000 bushels in 1928 (estimated).

Imports of soy-bean oil, soy-bean cake, and soy beans into the United States

[Pounds]

Year	Soy-bean oil	Soy-bean cake	Soy beans
1925	19,492,900	27,801,936	3,811,897
1926	30,711,687	42,869,187	3,727,628
1927	14,914,792	53,950,898	4,204,268
1928[1]	10,862,718	79,155,776	3,415,885

[1] 9 months only.

(*Turn to Page* 103)

The Use of Malt Sugar in Mayonnaise*

Increased Vitamin Content and Greater Life of Mayonnaise Result from Incorporation of the Malt Product

By W. M. BROWNELL

I AM requested by your esteemed President to prepare a short paper on malt products and their relation to the mayonnaise industry, and take pleasure in trying to comply with that wish, as any endeavor to contribute to the work your Association is engaged in is bound to result to the advantage of all.

Speaking of malt products, it can be safely said that everybody takes some malt almost daily in one form or another; in his bread, or cake, or crackers, in his candy, in his breakfast cereal, in his mayonnaise, in his cough medicine or in his tonic. The importance of malt products as a food is, therefore, apparent. The wide field of usefulness for malt, while not yet a matter of common knowledge, is becoming more generally understood and the consumption of malt and its products, in a variety of ways, is increasing daily. The grains of barley, while undergoing the process of malting, are transformed completely and the barley acquires, thereby, a greater nutritive value, and through the presence of the enzymes is able to contribute to the manufacture of malt sugar.

Malt sugar can be said to be a complete, rich and easily assimilable food and malt sugar powder is used either by itself, in mild or in combination with cod liver oil to overcome undernourishment. Malt is a good source for supplying vitamins B and C, but it contains also vitamin A and these vitamins accompany the malt sugar products in which malt is used. Malt Sugar is produced by enzymic action of malt on cereal starches of various kinds, including the starch contained in the malt itself. The leading food authorities throughout the world recognize malt sugar as a health food of the highest type. Malt Sugar is used on almost all prepared foods for infant feeding. It is the major ingredient in malted milk. Malt Sugar, as a food, has nutritive substance of great value owing to its high maltose content and to the presence in it of the various vitamins of the original grain. In the living organism of the human body the malt sugar is transformed into assimilable sugar more rapidly than is cane sugar. Malt Sugar is very easily digested and not being so sweet as cane sugar it can be taken in much larger quantities than cane sugar.

To emphasize the additional qualities possessed by malt sugar products, various calorific values are here alluded to, from which it can be seen that the presence of malt sugar increases the caloric value considerably.

Calorific values per pound

Mayonnaise	3000
Malt Extract Powder	2010
Malt Sugar Powder	1990
Malto-Dextrin Powder	1790
Sugar	1750
Skin Milk Powder	1640
Roast Beef	1620
White Bread	1190
Roast Leg Lamb	900
Ice Cream	900
Boiled Potatoes	440
Fresh Milk	325
Fresh Cod Fish	325

Since the first of the year exhaustive experiments have been conducted on mayonnaise made with and without malt sugar, and with and without cane sugar, using formulas varying in percentages of oil, egg, sugar, malt sugar and vinegar. The beating time was also varied from 7 to 28 minutes. Samples taken from these batches, together with samples of mayonnaise purchased in the open market, were then subjected to various tests, including the heat test, freezing test, shaker test, wagon test (hauling on one- and five-ton trucks). With few exceptions, it was found that the mayonnaise containing malt sugar held up far better than mayonnaise which did not contain it.

A basic formula was then adopted of:

79.5% Vegetable Oil
6.1% Whole Eggs or Yolk (containing malt sugar with salt added)
4.1% White Malt Sugar Powder
9.2% White Distilled Vinegar (50 grain)
0.6% Mustard
0.5% Salt, highest grade

(*Turn to Page* 115)

*Presented before the Mayonnaise Products Manufacturers' Association Convention, Atlantic City

The Composition of Porpoise Jaw Oil

Valuable Lubricant Shown to Consist of Mixture of Fatty Oil and Liquid Wax

By Augustus H. Gill and C. Mason Tucker[1]

AS IS well known, this oil is used chiefly for the lubrication of the finest machinery—as chronometers and clocks. Owing to increasing demand, it is becoming scarcer and much more expensive—(present price about $60.00 per gallon). Chevreul worked upon the blubber oil and reported the presence of iso-valeric acid or "acide phocenique"*, the name indicating the source, as is customary with fatty acids. He found also stearic, palmitic and oleic acids, and supposed the oil—like others—to be a glyceride. Lewkowitsch thought it should be reinvestigated and suggested that it might be a mixture of an oil and liquid wax—which it is. In view of this fact and with the thought that it might possibly be synthesized, it was subjected to examination.

The sample was furnished by Mr. Wordell of the William F. Nye Company of New Bedford, who vouched for its genuineness, and was from the head of the porpoise (*tursiops truncatus*) a fish about eight feet long, caught off Hatteras.

The characteristics of the oil were as follows:

Sp. Gr. 0.9241 at 15.5°C.
Saponification value 293
Refractive index 1.4519 at 20.5°C.
Iodine No. (Hanus) 28.3
Reichert Meissl No. 139
Acid value 2.88
Cold Test — 19°C.
Viscosity 101 sec. at 100° F. Saybolt
Rotation +0.3° 1 dm. tube (20.46 centipoise)

The oil was saponified with a measured quantity of N/2 alcoholic potash at a return flow condenser, and the result neutralized with a known amount of N/2 hydrochloric acid. The alcohol and water were evaporated upon the water bath. The residue was dissolved in water. The unsaponifiable matter was dissolved out with ether† the remaining solution evaporated to dryness at 105°, and weighed. This contains the potassium soaps, excess potassium chloride, glycerine and water. The latter was determined by distilling with toluene by Dean's method. The potassium chloride was calculated from the acid used. The glycerine was determined by the acetin method, using a fresh sample. The potassium soaps of the fatty acids were therefore determined by difference, and the weight of potassium in them being known, the weight of the fatty acids themselves was determined. The fatty acids on steam distillation showed themselves to be 96.8% volatile (iodine value 3.1) and 3.2% non-volatile (iodine value 32.6). Of the mixed acids, 89.6% came over between 170° and 171°, the iodine value was 0 and neutralization equivalent 104 (theory for valeric acid 102). Their ethyl esters boiled between 133° and 145°. The boiling points of the valeric esters vary from 144.6° for the normal to 133.5°. The presence of the valeric acids can therefore be considered as proven, but sufficient material was not at hand to determine which of the four isomers was present.

Mixed Acids

OF THE mixed acids 89.6% came over below 17.2°, leaving 10.4% difficulty volatile or non-volatile: there were 96.8% of volatile acids and 32% non-volatile or 86.7% (96.8 x 89.6=86.7) volatile acids. The neutralization equivalent of the non-volatile acids is 266 which corresponds to a mixture of palmitic and oleic acid. The iodine number of these acids is 32.6, corresponding to 36.2% $\left\{\frac{326}{900}\right\}$ oleic acid in the 10.4 non-volatile acids. This means there are in the non-volatile acids 100—86.7=13.3%; 36.2% or 4.8% oleic acid and 8.5% palmitic acid. This gives a neutralization value of 264.9 compared with 266 found: The acids would then be isovaleric 26.7, palmitic 8.5, oleic 4.8.

[1] Presented at Third Fall Meeting of American Oil Chemists' Society.

*From Delphinus phocoena, Latin name of the dolphin.

† Ether is found to be better as to forming emulsions than petroleum ether, benzol or chloroform; the mixture should be shaken with a rotary motion.

The unsaponifiable matter reacts with sodium and dissolves completely when treated with acetic anhydride showing the presence of higher alcohols. It becomes solid at 0° and distills between 300° and 310° with but little decomposition.

An ultimate analysis of this portion gave carbon 77.7%, hydrogen 13.5. Theory for dodecyl alcohol requires 77.4 and 13.97. A molecular weight determination in benzene gave 394.2 as against 392 for the double molecule. Doubling of the molecule in benzene is not unusual.

There is also present in the unsaponifiable matter a small quantity of a substance melting at 61°, the melting point of tetradecyl alcohol. The purification and separation of these alcohols is not easy, on account of their ready solubility in all the solvents in the laboratory. Distillation is the only method left and this with such small quantities is very unsatisfactory.

The analysis figures out somewhat as follows:

Dodecyl alcohol $C_{12}H_{25}IH$	13.7	per cent
Glycerol	18.5	" "
Fatty Acids	72.2	" "

made up of 62.6 per cent iso-valeric; 6.1 palmitic and 3.5 oleic. It will of course be remembered that these figures represent glycerol, alcohols and acids, contained in the oil, carrying OH and H groups, whereas in the oil itself these products are combined as esters.

The oil in question, would seem to be made up about as follows:

Free isovaleric acid	2.9	per cent
Mono di or tri isovalerin	59.9	" " by difference (Actually found 57.7)
Tri-Palmitin	6.4	" "
Tri-olein	3.6	" "
Dodecyl valerate	27.2	" "

It is assumed that the palmitic and oleic acids are present as the tri-glycerides: inasmuch as there is an excess of glycerine to form tri-valerin, it would seem to indicate that a mono- or di-valerin was present in the oil. No cholesterol was found.

In conclusion, the writers wish to acknowledge their indebtedness to Messrs. S. M. Thronson, E. L. Mitlying and L. N. Leum, assistants of the senior author, for careful work in checking up some of the results obtained.

Williams Sealing Corp., Decatur, Ill., makers of Kork-N-Seal caps, have started a new type of advertising in the *Saturday Evening Post*, supplementing the column announcements which have been running during the past several months and which have been designed to impress consumers with the desirability of products capped with the Williams seal. The new advertising, which is being done on smaller space, offers 50 special high pressure Kork-N-Seals for $1, suggesting the use of the cap in connection with ginger ale type bottles. The idea behind this advertising is to get the general public better acquainted with the features of the Williams cap.

Grocers Attack Margarine Tax

Repeal of federal and state license taxes on retail grocers who sell margarine will be sought by the National Association of Retail Grocers. The Association representing 80,000 retail grocery establishments in the United States regards as an "unjust discrimination against both grocers and consumers," according to C. H. Janssen, of St. Paul, secretary. A committee to undertake a definite national program to obtain relief from the margarine license taxes has been appointed.

"The retail grocer's tax on margarine places a burden of millions of dollars a year on the consuming public," declared Mr. Janssen. "The National Association of Retail Grocers opposes the levy of this tax on margarine and similar taxes on food and grocery products as an unjust discrimination against both grocers and consumers. Margarine is a wholesome food product manufactured under the strict supervision of the United States Food Inspection service of the Department of Agriculture and the product itself complies with all the regulations of the Food and Drugs Act. The ingredients of which margarine is composed are produced on American farms and the manufacture of margarine contributes materially to the prosperity of American farmers and consumers. The tax is an expense which the retail grocer can ill afford at present. Moreover it makes it difficult for the consuming public to obtain a useful, necessary and wholesome article of food."

New Oil Plant in Mexico

The Bureau of Foreign and Domestic Commerce reports that the Explotadora de Acietes Vegetales, capitalized at $150,000, at Mazatlan, Mexico, began construction in October last and is now starting business. All of the machinery, valued at $60,000, is of American manufacture and is of strictly modern design. This concern plans to import copra from Tahiti via San Francisco and to export copra meal and cottonseed meal. It plans also to handle coquita nuts from Sinaloa and Nayarit and cottonseed from Sonora.

Spanish Producers to Organize

According to recent advices from the Consular Office at Madrid, the Spanish Press is inclined to attribute the high price of olive oil to consumers to the operations of an excessive number of middlemen. The oil is purchased by commission merchants employed by the men who supply the retailers. According to local opinion, it is not exaggerating to say that the olive oil reaching the consumer through these regular channels increases in price from 30 to 40 percent. The belief has been expressed by some authorities that if the producers were to organize on a solid basis the natural result would be to reduce the number of middle men because they would take over the problem of distribution collectively. The cooperative idea has also been reported as having been accepted in the Assembly, in the Ateneo of Madrid of Olive Oil Exporters, and in the Congress of Olive Oil Producers and Exporters, which has been recently held in Seville. Granted that the producers did organize either by towns, regions, or on a national basis, they would not only control the domestic market, but would be in a more favorable position to regulate exportation.

Although olive oil exportation from Spain has averaged around a half million quintals annually over the period of the last 28 years, it is not consistent from season to season. This is due to various influences, among them being principally the demand for olive oil in the intermediary countries which re-export it. If there is a good crop in the producing countries, the intermediary countries reduce their purchases in Spain accordingly, and vice-versa. On the other hand, if the crop in Spain is light, the producers are not able to attend to the demands from the outside. In other words, the Spanish market is not under the control of the producers. The only solution to this question would be in the formation of an organization of the producers with a view to maintaining regularity in exportation. To accomplish this, however, and to eliminate such countries as France and Italy from acting as intermediaries in the sale of Spanish olive oil, it would be necessary to have disposable stocks on hand at all times. This is said to be impossible at the present time.

The successful organization of producers appears difficult in view of the fact that out of 400,000 here are only 10,000 associated commercially.

Soy Bean Trade

(*From Page 98*)

Imports Into the United States

PRODUCTION has not kept pace with the demand, however, and the United States is still a large importer, not only of the beans, but also of the cake and oil. Imports of cake and meal for the first nine months of 1928 approximated 40,000 short tons.

Soy-Bean-Oil Industry and Trade of the U. S.

SOY-BEAN oil, the product of the soy bean, is perhaps one of the most versatile of the great varieties of vegetable oils in world commerce to-day. Its most extensive use as an edible oil is in the manufacture of lard compounds and oleomargarine, and a small amount in salad oil. In addition to its uses as an edible product, it has the properties of a drying oil, which lends itself to the paint and varnish industry, the soap kettle, and the manufacture of linoleum and oilcloth, while small amounts are used for illuminating and lubricating purposes in its native country.

Soy-bean oil is obtained by two methods—pressure and solvent. The oil content of soy beans ranges from 12 to 23 per cent, depending on the locality of production and the efficiency of the presses—many of the bean mills in China and Manchuria being so primitive that they get only about 8 to 10 per cent of oil.

Imports of soy-bean oil into the United States fluctuate considerably, and at present are extremely small as compared with the period during and immediately following the World War, when so much shipping was diverted from European trade.

Soy-Bean Cake and Meal

OWING to its high protein content, ranging from 46 to 52 per cent and from 5 to 8 per cent oil, soy-bean meal is in great demand as cattle feed and commands a considerably higher price than either cottonseed meal or linseed meal. Soy-bean meal at Portland, Ore., one of the principal markets, has ranged from $50 to $60 per ton in the past five years.

Dr. William H. Nichols, Chairman of the Board of the Allied Chemical and Dye Corporation, Founder of The General Chemical Company and The Nichols Copper Company, one of America's best known chemists, died at Honolulu, T. H. on February 21, 1930, aged 78. Dr. Nichols, an outstanding figure in the country's chemical industry, will be mourned by hosts of friends and business associates.

Fat and Oil Data for Fourth Quarter 1929

Production, Consumption, Exports and Imports with Factory and Warehouse Stocks December 31, 1929

WASHINGTON, D. C., February 1, 1930.—The Department of Commerce announces that the factory production of fats and oils (exclusive of refined oil and derivatives) during the three-month period ended December 31, 1929, was as follows: vegetable oils, 1,043,869,998 pounds; fish oils, 33,546,738 pounds; animal fats, 595,875,825 pounds; and greases, 102,880,547 pounds; a total of 1,776,173,108 pounds. Of the several kinds of fats and oils covered by this inquiry, the greatest production, 713,676,902 pounds appears for cottonseed oil. Next in order is lard with 473,140,899 pounds; linseed oil with 182,227,710 pounds; tallow with 121,171,404 pounds; coconut oil with 78,289,535 pounds, and corn oil with 28,247,174 pounds.

The production of refined oils during the period was as follows: Cottonseed, 611,915,608 pounds; coconut, 78,289,535 pounds; peanut, 3,188,639 pounds; corn, 28,247,174 pounds; soya-bean, 1,735,802 pounds; and palm-kernel, 3,257,256 pounds. The quantity of crude oil used in the production of each of these refined oils is included in the figures of crude consumed.

The data for the factory production, factory consumption, imports, exports and factory and warehouse stocks of fats and oils and for the raw materials used in the production of vegetable oils for the three-month period appear in the following statements:

PRODUCTION, CONSUMPTION, AND STOCKS OF FATS AND OILS

(In some cases, where products were made by a continuous process, the intermediate products were not reported.)

KIND	Factory operations for the quarter ended December 31, 1929		Factory and Ware'se stocks
	Production (pounds)	Consumption (pounds)	Dec. 31, 1929 (pounds)
VEGETABLE OILS: [1]			
Cottonseed, crude	713,676,902	663,519,195	116,150,428
Cottonseed, refined	611,915,608	322,365,495	422,335,138
Peanut, virgin and crude	6,719,545	4,208,520	2,268,982
Peanut, refined	3,188,639	2,343,939	2,286,223
Coconut, or copra, crude	83,474,078	163,125,044	174,708,817
Coconut, or copra, refined	78,289,535	94,176,042	17,712,357
Corn, crude	32,618,347	36,873,737	11,556,733
Corn, refined	28,247,174	6,811,633	12,325,083
Soya-bean, crude	5,230,680	4,821,375	12,574,161
Soya-bean, refined	1,735,802	1,369,901	2,870,772
Olive, edible	417,337	546,452	6,113,680
Olive, inedible	16,000	1,454,405	1,461,333
Sulphur oil, or olive foots	—	8,588,408	8,471,173
Palm-kernel, crude	—	12,400,251	13,572,455
Palm-kernel, refined	3,257,256	3,805,596	1,195,913
Rapeseed	—	3,245,683	5,783,419
Linseed	182,227,710	106,054,528	140,860,386
Chinese wood or tung	—	22,700,121	29,398,429
Chinese vegetable tallow	—	893,921	2,422,514
Castor	17,021,789	5,358,554	14,347,277
Palm	—	52,863,715	52,579,213
All other	1,467,610	5,549,748	20,237,965
FISH OILS: [1]			
Cod and cod-liver	469,717	4,455,124	8,051,517
Menhaden	8,445,896	8,220,255	9,600,219
Whale	1,366,500	18,920,445	33,059,711
Herring, including sardine	22,374,510	12,915,881	52,095,905
Sperm	—	268,379	3,564,363
All other, (including marine animal)	890,115	1,955,013	11,267,376
ANIMAL FATS:			
Lard, neutral	10,992,150	8,740,227	4,174,186
Lard, other edible	462,148,749	4,910,392	69,901,746
Tallow, edible	11,342,348	6,621,170	3,161,199
Tallow, inedible	109,829,056	119,762,919	99,591,568
Neat's-foot oil	1,563,522	1,551,775	1,912,380

[1] The data of oils produced, consumed, and on hand by fish oil producers and fish canners were collected by the Bureau of Fisheries.

PRODUCTION, CONSUMPTION, AND STOCKS OF FATS AND OILS (Continued)

KIND	Factory operations for the quarter ended December 31, 1929 Production (pounds)	Consumption (pounds)	Factory and Ware'se stocks Dec. 31, 1929 (pounds)
GREASES:			
White	18,668,094	14,212,746	11,362,547
Yellow	21,567,214	12,896,590	12,183,156
Brown	12,163,725	12,641,397	13,756,999
Bone	6,324,770	262,634	1,994,576
Tankage	13,957,694	86,659	4,064,358
Garbage or house	22,623,510	17,089,707	15,528,768
Wool	2,726,518	1,536,232	4,291,000
Recovered	699,414	501,568	794,476
All other	4,149,608	1,072,613	2,541,983
OTHER PRODUCTS:			
Lard compounds and other lard substitutes	316,809,537	93,011	31,670,056
Hydrogenated oils	171,997,481	152,993,560	15,976,381
Stearin, vegetable	5,764,265	4,874,214	3,260,118
Stearin, animal, edible	17,296,642	15,416,223	4,955,319
Stearin, animal, inedible	4,517,975	6,820,505	3,446,588
Oleo oil	31,480,197	17,162,761	8,107,873
Lard oil	6,390,037	4,094,993	5,091,194
Tallow oil	2,646,639	2,546,920	1,865,459
Fatty acids	36,782,215	32,474,776	8,422,135
Fatty acids, distilled	9,558,343	6,055,310	2,256,729
Red oil	11,656,614	6,598,743	6,689,304
Stearic acid	9,031,568	2,400,495	5,694,480
Glycerin, crude 80% basis	35,697,468	42,803,769	14,170,434
Glycerin, dynamite	16,587,349	8,580,205	9,619,576
Glycerin, chemically pure	17,935,915	2,205,014	6,191,411
Cottonseed foots, 50% basis	80,443,114	61,004,019	35,106,790
Cottonseed foots, distilled	22,254,992	20,292,779	6,396,508
Other vegetable oil foots	11,769,262	12,542,038	3,134,772
Other vegetable oil foots, distilled	756,766	1,886,477	1,465,351
Acidulated soap stock	22,803,808	10,981,760	19,741,842
Miscellaneous soap stock	266,254	466,911	417,501

RAW MATERIALS USED IN THE MANUFACTURE OF VEGETABLE OILS

KIND	Tons of 2000 pounds Consumed Oct. 1 to Dec. 31	On hand Dec. 31	KIND	Tons of 2000 pounds Consumed Oct. 1 to Dec. 31	On hand Dec. 31
Cottonseed	1,150	553	Flaxseed	278,525	121,782
Peanuts, hulled	7,796	1,589	Castor beans	18,873	12,096
Peanuts, in the hull	4,105	1,091	Mustard seed	230	2,428
Copra	67,239	23,097	Soya-beans	19,829	14,403
Coconuts and skins	352	726	Olives	1,575	9
Corn germs	54,843	173	Other kinds	2,943	518

IMPORTS OF OIL SEEDS, QUARTER ENDED DEC. 31, 1929

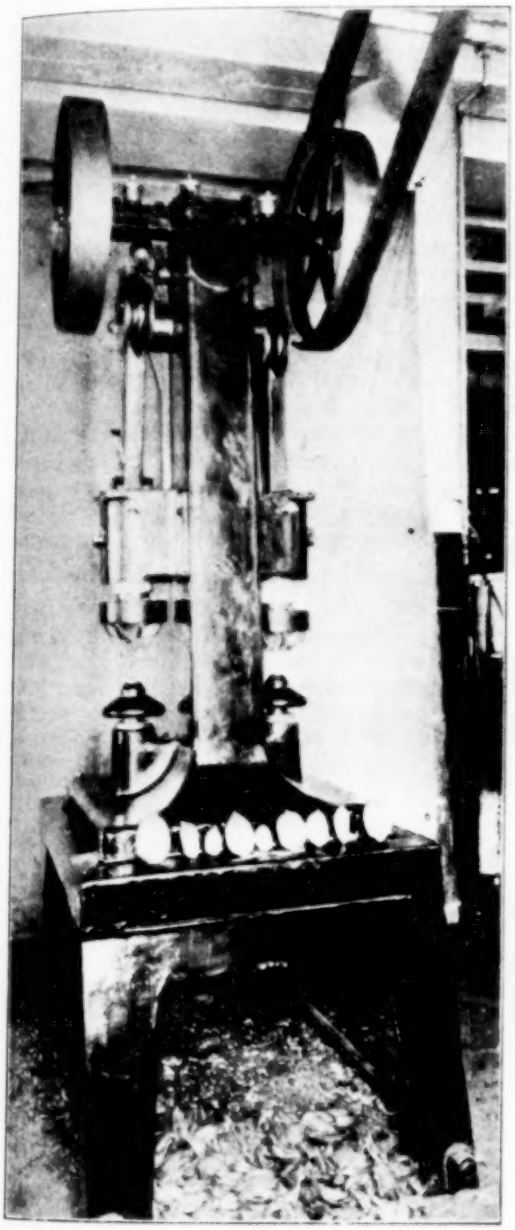
KIND	Tons	KIND	Tons
Cottonseed	81	Poppy seed	531
Castor beans	23,716	Perilla and sesame seed	398
Copra	51,953	Other oil seeds	3,593
Flaxseed	155,616		

IMPORTS OF FOREIGN FATS AND OILS, QUARTER ENDED DEC. 31, 1929

KIND	Pounds	KIND	Pounds
Animal oils & fats, edible	447,430	Palm-kernel oil	13,896,492
Whale oil	2,876,625	Sesame oil	3,137,083
Cod oil	5,148,705	Vegetable tallow	
Cod-liver oil	5,934,908	Vegetable wax	1,003,365
Other fish oils	20,311,350	Carnauba wax	989,640
Tallow	455,916	Peanut oil	483,549
Wool grease	2,075,633	Rape (colza) oil	4,901,895
Grease and oils, n.e.s. (value)	$292,425	Linseed oil	3,290,639
Olive oil, edible	21,597,588	Soya-bean oil	4,560,793
Tung oils	25,745,602	Perilla oil	30,000
Coconut oil	101,272,288	Other expressed oils	21,256,885
Sulphur oil or olive foots	8,313,957	Glycerin, crude	1,637,108
Other olive oil, inedible	2,064,671	Glycerin, refined	605,876
Palm oil	50,169,618		

Brazilian Babassu

(*From Page 93*)



Machine for cracking babassu nuts

Various Uses of the Palm

THE uses of the babassu palm are numerous. The green leaves serve as roofing and thatching material, and for the manufacture of hats, baskets, sails and sail bases. The stems of the fronds are used in making special baskets and shades.

The sap is used as a feedstuff and foodstuff, both raw and cooked, and is a satisfactory raw material for the manufacture of sugar. The fibrous covering of the nut is useful for the manufacture of cord, brushes and mats. The mealy substance between the shell and the kernels is used as a food by the natives and also as a cattle feed. It contains some considerable quantity of tannin and starch. The shell, which is very hard, is said to be used in the manufacture of buttons and other articles of domestic use, and would undoubtedly be of value for the preparation of active carbons for various purposes.

The state of Maranhao has sent to New York a film depicting the babassu industry, showing the forests, transportation methods, primitive methods of gathering and kernel extraction, as well as machine extraction by means of the machine described above.

Shortening and Oil Prices

Prices of shortening and salad and cooking oils on Thursday, Feb. 20, 1930, based on sales made by member companies of the Shortening and Oil Division of the National Cottonseed Products Association, were as follows:

SHORTENING

	Per lb.
North and Northeast:	
Carlots, 26,000 lbs.	@10¾
3,500 lbs. and up	@11
Less than 3,500 lbs.	@11½
Southeast:	
3,500 lbs.	@10½
Less than 35,000 lbs.	@11
Southwest:	
Carlots, 26,000 lbs.	@10½
10,000 lbs. and up	@10⅝
Less than 10,000 lbs.	@11⅛
Pacific Coast:	@11¼

SALAD OIL

North and Northeast:	
Carlots, 26,000 lbs.	@10½
5 bbls. and up	@11
1 to 4 bbls.	@11½
South:	
Carlots, 26,000 lbs.	@10¼
Less than carlots	@10¾
Pacific Coast:	@10¾

COOKING OIL—WHITE

⅛c per lb. less than salad oil.

COOKING OIL—YELLOW

¼c per lb. than salad oil.

The Sanitary Utility Company, manufacturers of grease recovery apparatus, formerly of 400 West Madison Street, Chicago, are now located in new quarters in the McCormick Building, 332 South Michigan Avenue.

Notes of the Industry

Shortenings Tax Favored

By a vote of 245 to 74 the house passed the bill (H. R. 6) introduced by Representative Gilbert N. Haugen of Iowa to apply the oleomargarin taxes to so-called "cooking compounds" made in semblance of butter.

Despite the fact that both margarin manufacturers and dairy interests strongly supported the measure, the debate of nearly three days which preceded the vote was marked by attacks from many angles, particularly by those who oppose all margarin taxes, those who seek continuance of the tax-free status of the products under consideration, and those who desire higher taxes on all butter substitutes. Most of the debate dealt with the qualities of margarin and other compounds, the condition of the dairy industry, and the importation of coconut oil from the Philippine Islands.

According to figures reported to the United States Bureau of Internal Revenue by margarin manufacturers, production in December, 1929, compared with the output in December, 1928, as follows:—

	Pounds	
	1929	1928
Uncolored oleomargarin	31,226,440	27,324,690
Colored oleomargarin	1,656,465	1,574,703

Sharples Separator Co., West Chester, Pennsylvania, are now marketing their Supercentrifugal in a laboratory model, which is a miniature of the standard commercial size. The laboratory model is intended for use in accomplishing on a small scale the same class of separations and clarifications for which the industrial equipment has proven suitable. The company has been working with such products as fine oils, varnishes, liquid soaps, etc.

Clifford T. Weihman of Smith-Weihman Co., Inc., has been nominated for President of the Oil Trades Association of New York for the coming year.

Lower freight rates on solid and liquid lard substitutes in carloads from Memphis, Tenn., to destinations in Oklahoma are sought in a complaint filed with the Interstate Commerce Commission by the Southern Cotton Oil Company, New Orleans, La.

Wesson Trademark Sustained

Sustaining the opposition of the Southern Cotton Oil Company, Jersey City, N. J., the United States Patent Office has refused the Globe Grain & Milling Company, Los Angeles, registration of "Westola" as a trademark for a shortening compound.

The Southern Cotton Oil Company is owner of the trademark, "Wesson," also used as a shortening. The Globe company in vain protested that its product is solid, is sold in bulk to large users, and is distributed only on the Pacific Coast and in Hawaii, while "Wesson" is a liquid, is sold in small containers, and is distributed to household users.

Refining-in-transit rates on cottonseed oil from Texas points to Los Angeles and San Francisco are sought by the Interstate Cotton Oil Refining Company, Sherman, Texas, in a complaint filed with the Interstate Commerce Commission.

Mechanical Manufacturing Co., Chicago, manufacturers of packing house and similar equipment, have been the recipients of a complaint from the Federal Trade Commission alleging the practice by the company of forced reciprocity in buying. The complaint alleges that the Mechanical company, said to be controlled by members of Swift and Company, has "induced and compelled" railways to purchase its "Durable" draft gear and other railway equipment by promises of great volume of tonnage from Swift and Company, or by threats that such freight will be diverted to other lines. The Mechanical Company has filed a general denial of the charges.

McCormick & Co., Baltimore, have declared the regular 4 per cent semi-annual dividend on their outstanding 8 per cent preferred stock. During the past year the company has turned down a number of offers to join large mergers. This policy, the company states, has been followed because practically all employes are stockholders in the corporation.

Oscar T. Quimby, chemist in the United States Forest Products Laboratory, Madison, Wis., has taken a position in the research division of the Procter & Gamble Company, Cincinnati.

O'Keefe Heads Wesson Oil

J. D. O'Keefe was elected president of Wesson Oil & Snowdrift Co., at a recent meeting held in New Orleans. Whitney Bank was elected to the board of directors to succeed John E. Bouden, deceased.

Chickasha Cotton Oil Company reports for the six months ended December 31, 1929, a net profit of $448,121 after charges, depreciation, and taxes, equal to $1.76 a share on 255,000 shares of stock.

Wesson Oil & Snowdrift Company common stock totalling 1,000,000 shares, without par value, has been approved for listing by the New York Stock Exchange, on notice of issuance.

Imports of copra into the United States during the month of November, 1929, amounted to 39,444,551 lbs.; value $1,512,681. Coconut oil imports totaled 24,727,953 lbs.; value $1,641,203. The chief sources of supply were the Philippine Islands, French Oceania and British Malaya.

The United States has produced 1,329,979 tons of margarine in the last ten years, according to a bulletin issued by the Institute of Margarine Manufacturers.

"Between 1920 and 1929," says the bulletin, "the nation's margarine output has totaled 2,659,549,000 pounds and the industry has distributed approximately a billion dollars to American business through the purchase of ingredients, wages to workers employed in plants, supplies, transportation, and sale of the product. Peak of margarine production was reached in 1920 when 391,279,512 pounds were produced. The output in 1929 amounted to 333,070,000 pounds. Margarine is distinctly a domestic product. It depends on farms in the United States and its island possessions for the wholesome fats, oils, and milk used in its composition. Its manufacture is a valuable source of revenue to farmers and ranchmen. As an economical spread for bread and use in cooking, this wholesome product saves housewives of America millions of dollars annually on their grocery bills. Although it is a comparatively young food industry, margarine manufacturing is already a $100,000,000 a year business. The economic importance of the margarine industry which combines many valuable food products into a palatable spread for bread is an important factor in promoting prosperity for the country."

Iodine Value of Mixed Oils

The Editor
Oil & Fat Industries,
New York
Sir:

The following formula for the determination of the respective percentages of two oils in a mixture consisting of only two oils, when the iodine numbers of the oils and that of the mixture are known, may be of interest to your readers.

Let N = Iodine number of the less saturated oil
N^1 = Iodine number of the more saturated oil
N^2 = Iodine number of the mixture

Also let x = amount in the mixture of the less saturated oil
y = amount in the mixture of the more saturated oil.

Then, assuming the entire mixture as unity,
$x+y=1$, $y=1-x$

The iodine value relationship may be expressed as:

$$x = \frac{N^2-N^1}{N-N^1}$$

$$y = 1 - \frac{N^2-N^1}{N-N^1}$$

For example, the iodine number of a mixture of olive and coconut oils in a certain sample of soap was ascertained by experiment to be 49 percent. Assuming average iodine numbers of olive and coconut oils to be 84 and 14 percent respectively, we have the following values for use in our equation: $N=84$, $N^1=14$, $N^2=49$. Then $x=\frac{49-14}{84-14}=\frac{35}{70}=50$ percent, and $y=1-x=50\%$. The mixture used by the soapmaker is thus revealed as consisting of equal parts of olive and coconut oils.

POWHATAN ROBERTSON.

Cottonseed Crushers to Meet in New Orleans

The Annual Meeting of the National Cottonseed Products Association will be held at the Roosevelt Hotel, New Orleans, on Monday, Tuesday and Wednesday, May 12th, 13th and 14th. The Rules Committee of the Association will meet at the same place on Friday and Saturday, May 9th and 10th. A record-breaking attendance is expected, as the meeting this year will mark the completion of the first season of operation under the auspices of the new enlarged association.

Travel Influences Tastes

WHAT Uncle Sam spreads on his bread is due in large measure to the influence of American tourists who travel abroad and bring back with them a liking for European eating habits, according to a bulletin issued here by the American Research Foundation.

"In the case of both butter and margarine the influence of foreign travelers is apparent," says the bulletin. "The demand for a light-colored, milk-flavored spread for bread, the sort that trans-Atlantic travelers are served in Europe, has caused manufacturers to adopt this type in America. Years ago a high-flavored high-colored spread was most in demand in this country. With the change from farm to creamery manufacture and the necessity of shipping the product long distances and keeping it for long periods, the preference shifted from a high to a mild flavor. Today most markets call for milk flavor in salted spreads. Milk gives modern margarine its palatable flavor and forms a large part of the composition of this wholesome product.

"Similarly there has been a shift from a high color to a straw color in the spreads for our bread. This is attributed by many authorities to the influence of European margarine on American tourists. The tourist cultivates a taste for this type and calls for it on returning to America. The widespread use of margarine in Europe is having a profound effect in promoting the popularity of this toothsome product in America. The American traveler abroad finds margarine on the table in the most fashionable cafes and restaurants of the Continent. He acquires a liking for margarine and naturally asks for it when he gets back home. With hundreds of thousands of Americans traveling abroad every year, the effect of their gustatory experiences in Europe is being felt in the whole range of America's cuisine."

Van Camp Expands

The Van Camp Packing Company has organized a new subsidiary company to handle the manufacture and marketing of Van Camp salad oil, shortening and other edible oil products. The new company, which will be known as the Van Camp Oil Co., will operate plants at Louisville, Kentucky and Baltimore, Maryland and will maintain a sales organization in New York. The Louisville plant is the one formerly owned by the Van Camp Company, while the Baltimore plant will be established in the property formerly occupied by The Pompeiian Corporation. The officers of the new corporation are: President, William D. Campbell; Vice-president, George Sirota; Secretary, J. E. Gavin; Treasurer, R. G. Bruenig; Directors, Nathan Musher, H. W. Grindall and William Scarborough.

New Booklet on Extraction

The C. O. Bartlett & Snow Company, of 6202 Harvard Avenue, Cleveland, Ohio, have issued a new brochure, their Bulletin No. 64, entitled "Solvent Extraction of Oils and Greases." This attractively designed and well printed booklet gives a historical outline of the development of Bartlett & Snow percolation and agitation extraction and fully describes the modern equipment being produced for these purposes by the company at the present time. The publication is well illustrated with views of Bartlett and Snow Agitator and Percolator Extractors, and with photographs of various extraction plants in which the equipment is installed. Copies of the bulletin will be mailed upon request to all who are interested.

ABSTRACTS

David Wesson, *Abstract Editor*

Commercial Extraction Solvents

Well purified and odorless special gasolene, boiling between 42 and 105° C. completely, is said to be the best solvent for use in the commercial extraction of oils and fats. The ordinary grades require careful purification with 66° sulfuric acid for the removal of aromatic hydrocarbons, and when so purified, will extract only the pure oil, free from impurities. Such a purified solvent may be recovered completely. Of the chlorinated solvents ethylene dichloride is preferred as yielding better products than trichlorethylene. Carbon tetrachloride has been abandoned, because of its tendency to hydrolyze, forming hydrochloric acid, with consequent corrosion of metallic equipment. Carbon disulfide has also been discarded because of its fire hazard and deleterious effect on the health of workmen. *Seifensieder-Ztg.* 56,370-2 (1929).

When linoleic acid was heated in a vacuum in the presence of active nickel, the specific gravity and index of refraction of the acid were increased and the iodine number diminished. These changes occurred only to small extent when the acid was heated without the active nickel. Upon heating the ethyl ester of the acid in a vacuum at 225° C. for five hours, the thiocyanogen value remained practically unchanged, the iodine value decreased, whereas the gravity, refraction and dispersion increased. No changes were recorded in similar treatment of the ethyl ester of oleic acid. The great changes in soya bean oil on heating with nickel are attributed to the glycerides of linoleic acid. *Chem. Weekbl.* 26,566-7 (1929) *Chem. Abstr.* 24,742 (1930).

A patent has been issued covering a process of deodorizing malodorous animal and vegetable oils, by mixing the material with 20% of its volume of water, heating with agitation to the boiling point of water, evaporating the water and heating to 115-20° C. to remove the last traces of water. U. S. Pat. No. 1,737,731.

"Doctored" linseed oil is produced by a method of removing mucilage and foots before boiling. A small portion of this "doctored" oil is added to the main body of oil in preparing boiled linseed oil by the steam-heating process. The oil should be permitted to stand two months after the addition of the "doctor" to facilitate settling of the foots and mucilage. *Ind. Chemist* 5, 403-5 (1929), *Chemical Abstracts* 24, 514 (1930).

Fatty glycerides, such as coconut oil, for example, may be saponified directly by dry alkaline carbonates in the presence of lipolytic substances such as sulfonated castor oil products, isopropylnaphthalenesulfonic acid or octohydroanthracenesulfonic acid. Brit. Pat. No. 308,603.

Substantially colorless sulfonated oils, fats, fatty acids and waxes may be prepared by sulfonating in the presence of hydrogen peroxide, persulfates, percarbonates or other suitable bleaching agents. U. S. Pat. No. 1,734,050.

A recent patent proposes to hydrogenate unsaturated oils and fats by adding them in emulsified form to cultures of hydrogen-generating bacteria. Ger. Pat. No. 482,919.

Castor oil can be made soluble in mineral hydrocarbons by heating it with oleic acid or stearic acid to 220-230° Centigrade, in vacuo. Ger. Pat. No. 482,634.

Developed grease products for use in treating textiles, for cutting lubricants and for tanning, may be prepared from a base obtained by treating a mixture of rosin and castor oil with hydrogen under pressure. Ger. Pat. No. 482,965.

Rancidity of vegetable oil used in coating compositions, lacquers and the like, may be prevented by the addition of magnesium oxide in the proportion of 2% of the weight of the oil.

Census Report (*Continued*)

EXPORTS OF FOREIGN FATS AND OILS, QUARTER ENDED DEC. 31, 1929

KIND	Pounds	KIND	Pounds
Fish oils	165,479	Palm & palm-kernel oil	524,414
Other animal oils & fats, inedible	53,698	Peanut oil	70,159
Olive oil, edible	28,008	Soya-bean oil	
Tung oil	1,373,541	Other expressed oils & fats	79,497
Coconut oil	535,213	Vegetable wax	120,974

EXPORTS OF DOMESTIC FATS AND OILS, QUARTER ENDED DEC. 31, 1929

KIND	Pounds	KIND	Pounds
Oleo oil	15,078,270	Other animal greases & fats	9,964,925
Oleo stock	1,710,426	Cottonseed oil, crude	8,061,989
Tallow	974,324	Cottonseed oil, refined	1,468,214
Lard	234,008,375	Corn oil	63,369
Lard neutral	3,775,640	Vegetable oil lard compounds	1,602,853
Lard compounds, containing animal fats	945,967	Other edible vegetable oils and fats	1,368,357
Oleo & lard stearin	817,056	Coconut oil	8,960,866
Neat's-foot oil	457,730	Linseed oil	661,579
Other animal oils, inedible	234,490	Soya-bean oil	1,208,597
Fish oils	354,342	Vegetable soap stock	2,397,846
Grease stearin	174,469	Other expressed oils and fats, inedible	1,828,222
Oleic acid, or red oil	719,820	Glycerin	258,316
Stearic acid	271,919		

Malt Sugar

(*From Page 99*)

Total beating time 8 minutes.

Total weight, 4116 grams to 8232 grams, made on a 30 quart machine. By means of a cork, with the proper size hole in it, the flow of the oil was regulated so that it flowed out in 8 minutes. This makes for a uniform product and eliminates guesswork.

During recent months a new product has been put on the market, which consists of a special white malt sugar powder with the highest grade salt added for use in liquid or frozen eggs. Experiments were conducted and it was found that best results are obtained by using the following formula:

85% Whole Eggs or Yolks
15% White Malt Sugar (with salt added)

By using whole eggs treated with malt sugar and salt a mayonnaise of high consistency and good color was produced.

Plant Manager—Position as manager of edible oil refinery desired by young man with fourteen years experience covering oil milling, refining, hydrogenation, shortening, salad oil, margarine, mayonnaise and confectioners' fats manufacture. Capable and experienced in design, construction and management. Reply to Box D25 c/o *Oil & Fat Industries.*

Davidson Commission Co., Chicago, oil and fat brokers, recently issued a twelve-page pamphlet listing the high and low prices for fats, oils and allied products for the years 1919 through 1929.

Prices

Candles, adamantine 6s 16 oz.			
20-set cases	**set.**	**.14½**	**.15¾**
40-set cases	**set.**	**.14**	**.14½**
Candles, paraffin, cs., 14 oz., case of 40 sets	**set.**	**.10**	**.10¼**
6s 14 oz., case of six cartons containing 36 sets	**set.**	**.11**	**.11¼**
6s 12 oz., 40 set cases	**set.**	**.09**	**.09¼**
6s 12 oz. cases of six cartons containing 36 sets	**set.**	**.10**	**.10¼**
Patent ends	**set.**	**.17¾**	**.18**
Stearin 6s 16 oz., plain, cases	**set.**	**.16¾**	**.17**
Castor, No. 1, bbls.	lb.	.12¼	.12½
No. 3, bbls.	lb.	.11¾	.12
Chinawood, bbls. or drs.	lb.	.11	.11½
Coast, tanks, spot	lb.	.09¾	.10
Futures	lb.	.09¾	.10
Coconut, Ceylon grade, bbls.	lb.	.07½	.07¾
Coast, Tanks, Domestic White	lb.	.06⅜	.06½
Cochin grade, bbls.	lb.	.08⅛	.08⅜
Manila, bbls.	lb.	.07½	.07¾
Tanks, N. Y.	lb.	.06⅞	.07
Fatty acids, mill, tanks	lb.	.10¾	nom.
Cod, Newfoundland, bbls.	gal.	.53	.59
Copra, bags, coast	lb.	.04⅛	—
Corn, tanks, mills	lb.	.07⅞	—
Bbls., New York	lb.	.10	nom.
Refined, bbls.	lb.	.10½	nom.
Fatty acid	lb.	.08⅝	nom.
Cottonseed, crude, tanks, mills	lb.	.07⅜	.07½
P. S. Y.	lb.	.08⅜	.08½
Fatty acids, mill, bbls.	lb.	.09⅛	—
Degras, domestic, bbls.	lb.	.03¾	.04½
English, bbls.	**lb.**	**.04½**	**.05**
German, bbls.	lb.	.03¼	.03¾
Neutral, domestic, bbls.	lb.	.07¾	.09½
English, bbls.	**lb.**	**.08**	**.09**
German, bbls.	**lb.**	**.07**	**.07½**
Greases, choice white, bbl. N. Y.	lb.	.07	.08¾
Yellow	lb.	.05⅞	.06
Brown	lb.	.05¾	.05⅜
House	lb.	.05⅞	.06
Herring, coast tanks	gal.	—	nom.
Horse, bbls.	lb.	.09½	nom.
Lard, city, tierces	lb.	.10½	—
Compound, tierces	lb.	.10¾	.11
Middle Western, tierces	lb.	.11	—
Neutral, tierces	lb.	.12	—
Prime Western, tierces	lb.	.11	—
Lard oil, No. 1, bbls.	lb.	.10½	—
No. 2, bbls.	lb.	.10	—
Extra bbls.	lb.	.11½	—
No. 1, bbls.	lb.	.11	—
Winter strained, bbls.	lb.	.12¼	—
Prime, bbls.	lb.	.13¼	—
Linseed Oil, boiled, tanks	lb.	.1360	—
Car lots, bbls.	lb.	.1440	—
Less car lots, bbls.	lb.	.1480	—
Less than 5 bbls.	lb.	.1520	—
Double boiled, less than 5 bbls.	lb.	.1550	.1580
Raw, tanks	lb.	.1320	—
Car lots, bbls.	lb.	.1400	—
Less car lots, bbls.	lb.	.1440	—
Less than 5 bbls.	lb.	.1480	—
Refined, bbls.	lb.	.1470	.1510
Varnish grades, bbls.	lb.	.1490	.1530
Linseed cake, bags	ton	36.00	—
Meal, bags	ton	46.00	—
Menhaden, crude, tanks, Baltimore	gal.	.45	nom.
Light pressed, bbls.	gal.	.58	.60
Yellow bleached, bbls.	gal.	.60	.62
White bleached, bbls.	gal.	.63	.65
Mustard, bbls.	gal.	.90	—
Neatsfoot, cold pressed, bbls.	lb.	.17¼	—
Extra, bbls.	lb.	.11½	—
No. 1, bbls.	lb.	.10¾	—
Pure, bbls.	lb.	.13	—
Oleo, No. 1, bbls.	lb.	.12⅜	—
No. 2, bbls.	lb.	.11⅛	—
Olive, denatured, bbls. N. Y.	gal.	.90	.92
Shipments	gal.	.80	.85
Foots, bbls.	lb.	.08	—
Shipments	lb.	.07	.07½
Edible, bbls.	lb.	2.00	2.40
Palm, Lagos, casks, spot	lb.	.07¼	.07⅜
Shipments	lb.	.07	—
Niger, casks, spot	lb.	.06⅞	.07
Shipments	lb.	.06⅝	.06¾
Palm Kernel, pkgs.	lb.	.07⅝	.07¾
Tank cars	lb.	.07⅛	.07¼
Peanut, crude, bbls.	lb.	.09¼	.09½
Mills, tanks	lb.	.07¼	—
Refined, bbls.	lb.	.12½	.13
Perilla, bbl.	lb.	.12¾	.13
Poppy Seed, bbls.	gal.	1.70	—
Rapeseed, blown, bbls.	gal.	.92	.93
Refined, bbls.	lb.	.70	.72
Red Oil, distilled, bbls.	lb.	.10⅛	.10⅜
Tanks	lb.	.09¼	—
Saponified, bbls.	lb.	.10⅛	.10⅜
Tanks	lb.	.09¼	—
Salmon, coast, tanks	gal.	.44	nom.
Sardine, coast, tanks	gal.	.42½	nom.
Sesame, refined, drums	lb.	.12	.12½
Soya Bean, blown, bbls.	lb.	.11¾	.12
Crude, bbls.	lb.	.11¼	.11½
Orient, coast, tanks	lb.	.09¼	.09½
Sperm, bleached f.o.b., New Bedford, bbls.	**gal.**	**.84**	**.85**
Natural, f.o.b., New Bedford, bbls.	**gal.**	**.78**	**.80**
Stearic Acid, Double pressed, bags	lb.	.14½	.15
Triple pressed, bags	lb.	.16½	.17
Stearine oleo, bbls.	lb	.09¼	.09⅝
Tallow, edible, bbls.	lb	.07¾	.07⅞
City, extra, works, loose	lb.	.06⅞	—
Special, works, loose	lb.	.06⅝	—
Tallow oil, acidless, bbls.	lb.	.10¼	—
Tanks, N. Y.	lb.	.10	—
Vegetable tallow, coast, mats	lb.	.06⅞	—
Whale, crude, No. 1, coast, tanks	**lb.**	**.07**	—
No. 2, coast, tanks	**lb.**	**.06½**	—
Refined, winter bleached, bbls.	**gal.**	**.80**	—
Extra, bbls.	**gal.**	**.82**	—
Natural, bbls.	gal.	.78	—

Market Report on

FATS, OILS AND GREASES

(*As of February 26, 1930*)

NEW YORK—Prices in the market for oils, fats and greases showed a continued downward movement throughout the recent period. About half of the items in the price list showed further declines ranging from ⅛c to 1c lb. Buyers are still in favorable position, with large stocks, and continue to depress prices by refusing to buy except at concessions. Purchases were few and were limited to small amounts. Several reductions were made in the price of chinawood oil, paralleling a weakness in Chinese exchange. Coconut oil also declined in price, as offerings increased. Grease declined on all grades as competition became keener among sellers. Tallow was priced lower all through the period as offerings increased while demand was quiet. Corn oil, cottonseed oil and linseed oil were unchanged in price from last period, with little activity in the respective markets. The only advance of any importance was made in lard which met a better demand toward the close of the period.

Chinawood Oil

Another substantial decline was observed in chinawood oil prices, resulting from weakened Chinese exchange. Silver established a new low record during the period. Wood oil in barrels was quoted at an inside price of 11c lb. 1½c under the closing prices of last period which were an equal amount under the quotations of the previous period. Tanks on the Coast were quoted at 9¾c lb., inside.

Coconut Oil

Manila oil was quoted at 7½c lb. in bbls. on spot, ½c lb. under the closing price of last period. Weakness in this oil was noticeable all during the month, resulting from small demand and increased offerings of bulk oil in primary markets.

Corn Oil

This market was in steady position during the recent period, with fair inquiry and no great abundance of offerings. There were fractional advances and declines, at various times, but the period closed with prices back at the initial position.

Cottonseed Oil

This market was a quiet affair during the recent period, with orders few and traders inactive. Buyers were content to hold off awaiting further developments in the general business situation. No quotable price change was noted at the close of the period.

Grease

In a generally declining market grease prices were shaded all along the line as sellers entered into severe competition for a limited amount of business. Yellow and house grease were quoted as low as 5⅞c lb. at the close of the period, the lowest level which has been reached in many months.

Lard

Lard was the only item to show even a small advance in price in the generally declining market. Domestic buyers showed a renewed interest in the product toward the close of the period, and bid up prices ¼c lb. for lard and lard compound, which closed at 10½c and 10¾c lb., respectively.

Menhaden Oil

Menhaden oil again declined, registering a drop of 6c gal. after falling 3c gal. last period.

Tallow

A lack of demand for tallow sent prices down ½c to 1c lb. on the various grades during the period just closed.

In affecting distillation of the constituents of fats, oils, tars, etc., by the introdution of liquids such as naphtha or water beneath the surface of liquids from which volatile substances are to be expelled (the temperatures being such that the first liquid is suddenly vaporized in the second) a special apparatus is used for introducing the first liquid without premature volatilization. Brit. Pat. No. 313,254.

OIL & FAT INDUSTRIES

The Editor's Page

The Chemical Age

AS TIME, the inexorable, continues on his endless round, those who attempt to visualize the progress of mankind must constantly change their conceptions of the world, its governments, its social motivations, the ideas, ethics and morals of peoples, and above all, the trend of civilization as exemplified particularly by the major type of man's constructions and manufactures.

Thus the geologist, the archeologist and the antiquarian have been able to portray for us the strivings upward of mankind through countless ages, out of the nomadic darkness of fireless existence into and successively through the epochs when stone, wood, copper, bronze and iron were each ascendant in man's economy.

Mediæval civilization, as distinguished from that of the ancients, was characterized by the development of particular skill in the arts, especially as applied to painting, weaving of fine fabrics and the working of delicate designs in the precious metals. The progress of civilization has been halted from time to time and on occasions has seemed even to retrogress, but in the main, progress has been quite steady.

Our modern civilization, which of course had its ultimate foundations in the revival of learning in Europe during the early part of the present millennium, appears to owe its life and nature to four major factors, namely; steam, steel, electricity and blasting powder. Of these factors, three are essentially forces, the fourth a material of construction, useful for buildings and machinery.

Close observers of manufacturing development in the current era note that the production of synthetic materials by chemical methods is forging into such prominence as to already stand equal with the production of steel, not in volume but as an indication of the type of mankind's mental progress. The past twenty years have given us synthetic plastic materials, cellulose fabrics, composition wall boards, synthetic solvents beyond number, foodstuffs, lacquers, and many other examples of the versatility of the chemist and the engineer. The development of new products and processes has made great advances, but may be said to have only scratched the surface of the possibilities. We confidently expect the next ten years to show even more adaptation of chemical synthesis to the useful arts than was achieved in the past.

Fools and Fortunes

WE VERY occasionally get a chance to do a little reading on subjects somewhat apart from oils, fats and soap. In a recent issue of our esteemed contemporary, "Collier's Weekly" there appeared an article entitled "Figgerin' Fools" which we respectfully recommend to the attention of the oil producing and refining industries of this country.

The author shows how the boys who, when in school, exhibited especial aptitude for mathematics, have developed into the modern statisticians who chart the course of business in all successful lines. The subject is developed by the example method, the examples including that of the telephone company which is forced to install the automatic switching system because the statistician has proven from facts and figures that in 1950 there will not be available a sufficient number of suitable young women to operate the manual switchboards. Another example cited was that of a coal merchant in one of our largest cities who changed an annual loss into a profit through acting on the advice of a "figure hound" as to proper seasonal distribution of sales and purchases.

In summary, it is today clearly apparent that proper and intensive study of figures will invariably reveal the trend of buying habits, of demand and of supply as well. The effect upon an industry of import or export tariffs can be clearly charted by the persistent statistician who has available records of foreign and domestic trade before and after the imposition of the duties. The same records over a period of years will inevitably disclose the changing hab-

its of the nation. We feel sure that the proper set of figures will tell the trained statistician what percentage of American housewives have entirely abandoned baking, and what percentage still prepare their own cakes and pies, even while relying on the baker for the daily bread supply. Figures too, will reveal how many mix their own mayonnaise and other salad dressings and how many bring home these essentials of epicurean living from the corner grocery or delicatessen shop.

If the oil producers and refiners, either individually or through their trade associations, will avail themselves of the controlling facts and figures of their trade, which figures are surely available through the Departments of Commerce and Agriculture and through many published buying-habit surveys, they will be able so to plan and develop their businesses, individually, collectively, or both, that they can be bravely independent of tariffs and other legislative acts, secure in the knowledge that they command their commercial fates and fortunes.

Manila Copra Cable

According to a cable from Trade Commissioner Howard at Manila, on March 20, copra prices declined throughout February and well into March. Production of copra was about fifty percent of the same period of last year and arrivals continued to be very low. Receipts at Manila to March 18th were 96,083 bags, at Cebu to March 14th 93,654 bags. The leaf miner pest situation is still critical in the districts affected, as the pest has been carried by the winds into new territory despite efforts to establish a deadline.

Weihman Heads Oil Trades

Clifford T. Weihman, of the Smith-Weihman Co., Inc., was elected president of the Oil Trades Association of New York at the annual election on March 27. A. A. Hoffman was elected vice-president and Philip C. Meon, treasurer, while J. C. Smith was re-elected secretary. The new directors, in addition to the officers, ex-officio, are Albert J. Squier, R. E. E. Hood, Wm. L. Koburger, George Suraud, William Stewart Williams, Edwin Stern and C. Rogers Brown. Thirty-five new members were elected to the association during the year. Following the reports of officers and other general business, Philip C. Meon, the retiring president, thanked the officers and committees for their untiring support, and after inducting Mr. Weihman into office, pledged his best efforts to make the new administration an unqualified success.

The production of palm oil in Java during November amounted to 2,180,548 kilos, and the production from January to November was 24,364,052 kilos. The production of palm kernels for November amounted to 425,053 kilos, making a total of 4,793,291 kilos produced from January to November. *U. S. Dept. of Commerce.*

A report from Consul General Osborne at Stockholm, Sweden, states that increased imports of vegetable oils indicated a continued expansion in Swedish margarine industry. Except for soya beans which registered a slight increase there was a marked decline in the volume of oilseeds imports.

Wesson Oil and Snowdrift Company reports a consolidated net income for the quarter ended November 30 of $758,177, equal after cumulative convertible dividends to 60c a share on 600,000 common shares.

Foreign Trade Opportunities

The Bureau of Foreign and Domestic Commerce of the Department of Commerce announces that its representatives in all parts of the world have forwarded the following trade inquiries of interest to our readers. In writing the Bureau in reference to any of these inquiries please mention that you saw it in *Oil & Fat Industries.*

No.	Location	Material	Purchase or Agency
43876	Egypt	Oils	Both
43788	Germany	Nut Oils	Purchase
44111	Colombia	Lard	Agency
43916	Canada	Coconut Oil	Both
44009	Canada	Edible Oils	Purchase
43989	Chile	Edible Oils	Agency
44222	England	Greases	Purchase
44157	England	Tallow	Purchase
44339	Ecuador	Lard & Shorten'g	Agency
44234	Germany	Soap Oils	Purchase
44330	Italy	Wool Grease	Agency
44340	Austria	Cooking Fats	Either

The Margarine Industry of Europe

By E. L. Thomas

*Specialist in Meats, Fats and Oils, in Collaboration with Field Representatives of the Bureau of Foreign and Domestic Commerce**

RECENT mergers, acquisitions by the European margarine trust, and intensive merchandising campaigns throughout Europe to increase the popularity of margarine and expand the consumer markets for the product, have accentuated interest in this industry abroad.

This article, therefore, as it embraces all of the leading margarine producing countries of Europe, is offered to fill a want and supply a service of information of particular interest to manufacturers of margarine and producers of other fats for food purposes in the United States.

PART III

FINLAND, Czeckoslovakia, Austria, Italy and Switzerland consume margarine in a small way and have a few manufacturing establishments. In Finland, for instance with fifteen plants operating in 1928 the total production was but 9,900 metric tons and the imports practically nil. Czeckoslovakia does not rate as a large importer of margarine while the industry of the country which is of modest dimensions is largely in the hands of a concern affiliated with the Union.

Artificial Coloring

MOST of the margarine sold in Great Britain is colored. There is no requirement for the introduction into the product of coloring matter to distinguish margarine from butter. In 1926 the Imperial Economic Committee on Marketing issued a report the substance of which was that there appeared to be no necessity for legislation of this nature pending completion of research studies being undertaken to determine whether there was any association between the natural color of butter and its vitamin properties. If the result of this research should indicate such association existing, the Committee stated its intention of recommending prohibition of the use of coloring materials in butter and likewise margarine. There has been no further action taken to date.

Southern Germany prefers an uncolored product while the central and northern sections favor the colored article. There are no taxes imposed by the government upon the use of artificial coloring matter. Until 1925 the use of coloring matter was prohibited by law in Denmark. With this regulation no longer in force much of the margarine consumed in Denmark is colored for which the government assesses no tax.

The artificial coloring matter most extensively used in the Netherlands is Napthol red which has the approval of the authorities. Although requiring a permit for the manufacture of margarine, the Norwegian government exacts no tax and all margarine sold in that country is colored. This is likewise true of Sweden but margarine imported or intended for export must contain potato starch in such quantities that the starch will be found in the finished product to at least one tenth of one per cent and not more than one-fifth of one per cent.

France forbids the introduction of artificial coloring substances into margarine and the regulation is stringently enforced. As a matter of fact, until comparatively recently, a retailer of butter might not expose margarine for sale in his shop and vice versa. The French food inspection service announced recently the issuance in the early future of a regulation obligating manufacturers of margarine to incorporate in their formulae a small quantity of starch to prevent unscrupulous retailers, mixing margarine with butter for sale as "butter."

Spain has legislation on its statute books against the use of artificial coloring matter and the sale of margarine in circumstances that might lead to the confusion of margarine with

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butter. The manufacture of and sale of margarine on the same premises as butter is contrary to law although exceptions to this regulation are authorized at times.

Vitamins

ONLY one manufacturer in Great Britain at the present time is known to be making a vitamized margarine which he guarantees to be equal to the best grade of butter in nutritive qualities. Many of the smaller producers have put on the market margarines containing ingredients used solely for adding vitamins. It is the consensus of opinion of the industry in Great Britain, however, that the artificial incorporation of vitamins has not increased sales to any extent and the largest churner in all of Europe has expressed the opinion that the consumer does not desire such a product, but rather a natural margarine.

Many German manufacturers are offering their public margarines containing adequate quantities of Vitamins A and D. The source of these vitamins is not definitely known. Egg yolk has the required vitamins and soya lecithin is also claimed to be equal to egg yolk. The latter is being manufactured in Germany and is reputed to be much cheaper than egg yolk. No appreciable increase in the sale of margarine has been ascribed as yet to the vitamin innovation. Some brands of Danish margarines contain vitamins introduced into the product to supplement the natural vitamin content but experimental work is still going forward in this field. Some of the concerns in the Netherlands affiliated with the Margarine Union have attempted to create consumer demand for vitamized margarines through advertising but these trial efforts are said to have been unsatisfactory. Laboratory research into the problem is still being conducted.

One of the larger Norwegian churners has put on the market a full line embracing all grades of vitamized margarines and another is advertising its brands as containing vitamins. Nothing has been disclosed of the process which remains a well-guarded secret. The firm first mentioned has a staff of expert chemists engaged in research. In view of the prevailing opinion in Norway that margarine consumption is probably at its peak it is hardly possible to increase sales, the object of the manufacturers being apparently to endeavor to stimulate a demand for the improved product. Swedish producers are experimenting with vitamizing processes and about 2 or 3 per cent of Swedish margarine now contains cod liver oil to supply vitamins A and D. Churners have found that a certain prejudice on the part of the consumer has developed by reason of the difference in taste imparted by vitamins, but this is said not to have affected its sale because the class of trade buying margarine of this type is convinced of its beneficial qualities. Thus far vitamizing of margarines has been confined to vegetable fat products the sale of which because of its added vitamin value has not expanded to any extent up to the present.

Vitamins are unknown to the French industry and no vitamized margarine of domestic origin has made an appearance on the market. French churners appear to exhibit some trepidation in venturing into this field and doubt the success of a campaign to launch a vitamized article because of the much greater popularity of butter in France. There has been little or no practical application of the principles of vitamizing in the manufacture of margarine in Belgium so far as is known although some experimentation has been undertaken. Manufacturers acknowledge a general lack of information on the subject and state considerable research will be necessary before satisfactory results can be achieved.

Advertising and Sales Methods

THE two largest firms of churners in Great Britain maintain chains of retail stores in which they sell their products as well as other food commodities such as tea, coffee, spices, sugar, dairy products, etc. The remainder of the production is distributed through wholesalers. The customary container is a tub from which bulk sales are made in the quantity desired by the customer. Cardboard cartons of 1 or 2 pound sizes are also in wide vogue. The average retail price varies from 6d ($.12) for the cheaper grades to 1s 4d ($.32) per pound for margarines of superior quality. Recent statistics showing the composition of sales are not available for reference purposes but in 1922 approximately 62 per cent consisted of the cheaper grades which percentage is estimated at the present time to have dropped to but 34%. This is indicative of a growing consumer preference for the better grades of margarine.

A study of prevailing wholesale prices of margarine and butter in Berlin in the past five years shows practically no changes for margarine whereas butter quotations have varied somewhat. The average during that period for butter has been nearly thrice the current price for margarine. Compared with 1913, Berlin market prices for margarines, over the past year were 18% higher while butter advanced 52% in price. The sales turnover of medium and fancy grades throughout is satisfactory but

sales of cheaper grades of margarines in some districts show gains though this increased volume has not been profitable in every instance, one reason being the practice of giving premiums which manufacturers have found hard to abolish.

Recently in the Netherlands the Union organized a new subsidiary sales organization the name of which is "Margarine Sales Central Limited." The purpose of the company will be to engage in the wholesale and retail merchandising of margarine, butter and other milk products, edible fats and oils for its own account as well as for the account of third parties. An innovation will be inaugurated in that the services of salesmen will be dispensed with in each of the eleven provinces of the Netherlands. Merchants will be required to send in their orders to the district sales offices of the company one of which is to be established in each province. The outcome of this new departure in merchandising will be watched with interest by margarine manufacturers.

The Union is reported to have spent the equivalent of $7,680,000 for advertising in 1928. Wholesale prices were increased on March 14th this year from Fl.46 ($18.40) per 100 kilos to Fl.54 ($21.60) per 100 kilos (220.46 pounds) constituting a price advance of $0.032 per kilo. Consistently low prices particularly on the lower grades have built up a trade estimated at 800 to 900 tons of the lower priced goods out of a total production of 1,100 metric tons per week.

Several brands of margarine receive extensive advertising in Norwegian newspapers, street cars and through other media. The trademarks of all the more popular brands thus receive general recognition. Seven of the most important margarine churners in Sweden combined in a cooperative selling agency in 1926 for the purpose of stabilizing prices and restricting competition. Three members of this group known as the Selling Organization of the Margarine Factories are subsidiaries of the Margarine Union. Cooperation does not extend to the purchase of raw materials or any other phases of manufacture and no common sales method or plan is pursued. One of the members has established branch warehouses and now has about fifty besides two branch sales offices and several agents. Another travels fourteen salesmen and maintains three district sales offices. Other manufacturers, some of them outside the selling organization sell chiefly through representatives on the road or wholesalers.

Legislative Measures

IN MOST of the European countries regulatory control if existing is confined to regulations governing artificial coloring which has been treated in a preceding section of this article. Certain countries, however, prescribe requirements which must be met by manufacturers. In Great Britain, for instance, the Butter and Margarine Act of 1907 defines the product and specifies that not more than 10% of butter fat may be added in the process of manufacture. Water content must not exceed 15%. According to the Public Health Regulations of 1925 which became effective January 1, 1927 the use of preservatives except salt is prohibited and it is further provided by the same act that manufacturing establishments must be registered with local authorities and shall be subject to inspection by officers of the Ministries of Health and Agriculture. Records of all consignments must be kept.

The government of the Netherlands under the Margarine Decree of October 16, 1925 promulgated various regulations affecting the industry. Under the provisions of this Decree the fat content must not be lower than 80% nor moisture in excess of 15%. Preserving agents other than common salt and benzoic acid or benzoic acid salt may not be present and total quantity of benzoic acid proper or contained in benzoic acid compounds may not exceed a definite limit. Foreign matter detrimental to health may not be present and the product must not be rancid, mouldy or possessed of an abnormal taste or odor. Five grams of the melted and filtered fat of the margarine must contain butter fat to a minimum of 3.0 in terms of the new "Kirschner" figure if in addition to the name "Margarine," the word "melange" is used. This last requirement is not enforced, however, when it is shown that the product is destined for export unless such product is stored at a place readily accessible to the domestic public. Each margarine factory in France is under the supervision of a government sanitary inspection service officer who receives his remuneration from the management of the plant.

An insecticide which is unaltered by time and which may be made into an emulsion is obtained by the addition of fatty acids, sulfonated fatty acids, abietic acid or naphthenic acids to a petroleum extraction of pyrethrum. Neutral substances which lower the surface tension between petroleum and alkaline water may also be added. Fr. Pat. No. 660,982.

Free Acid Important in Cotton Seed Value Index

Description of Basis Cotton Seed and Formulae for Determining Value Index in Relation to Basis Seed Quotations

By G. S. Meloy *

THE plan that has been suggested for evaluating or grading cotton seed contemplates the adoption of the following definition of Basis Cotton Seed and that all quotations for cotton seed shall be made on seed meeting the definition:

"Basis Cotton Seed shall be cotton seed that analyze 19.00% oil, 3.5% ammonia, 11% tare and not to exceed 2% Free Fatty Acids at time of purchase."

It contemplates further that seed analyzing other than as defined shall be evaluated by an index. That the index shall be ascertained in the following manner: The seed shall be analyzed for oil, ammonia, tare and Free Fatty Acids. To the pounds of oil as indicated by such analysis add a figure found by dividing the indicated pounds of 8% cake by the ratio of the price of a pound of 8% cake to the price of a pound of crude oil. The figure so found, referred to herein as the reciprocal, for Basis cotton seed shall be taken as par or Index 190. The index of seed analyzing other than as in the basis analysis is determined by dividing its reciprocal by the reciprocal of Basis cotton seed. And further, that discounts shall be applied to the index value at a rate not to exceed .3% for each .1% increase in Free Fatty Acids in the seed at time of purchase, provided that no additional discount shall be permitted on account of Free Fatty Acids above 18.5%. The average ratio of value of units of 8% cake and prime crude cotton seed oil is 5 and this ratio with its resultant reciprocal 555.0 has been suggested for use as a constant.

At the annual Convention of the Interstate Cotton Seed Crushers' Association held in New Orleans, La., May 16, 1929, it was suggested that if the percentage of both oil and ammonia were always calculated and reported on the basis of a constant and standardized tare, and that the actual tare be determined and reported, the method would have material advantages. The index may, of course, be determined from the "as is" analyses of seed, but the suggestion that the percentages of oil and of ammonia be reported on a standard tare has the following advantages.

First, that every analytical report will give a direct picture of any lot of seed both "on arrival" and after it has been cleaned and conditioned for crushing operations. Second, that we will thereby build up a series of data to show the relation, if any there be, between the oil and the ammonia content of cotton seed and the variety of seed, soil, fertilizer, rainfall, cultural practices and any other natural or controlled factors that may affect seed production.

Third, if a table of repetends for oil and ammonia is prepared, the index may be determined at any price radical, by simply dividing the difference between the analysis of Basis cotton Seed and the actual percentage of oil and/or ammonia, and/or tare, by the proper repetends.

For convenience in determining the index the following terms and formulae are useful.

The *Reciprocal*† is the figure representing the indicated pounds of oil, plus the indicated pounds of 8% cake divided by the radical. The *Radical* is the ratio of the value of a pound of oil to that of a pound of 8% cake. *Index 100* is the reciprocal resulting from seed analyzing 19.00% oil, 3.5% ammonia and 11% tare. *Standard tare* is 11%.

The Quantitative Index is determined by dividing the reciprocal resulting from the analysis of "As is" seed by the reciprocal of basis seed, or, from analysis of oil and ammonia on the basis of a standard tare, by the use of repetends.

*Bureau of Agric. Economics, U. S. Dept. of Agric.

†Sometimes referred to as the cake-oil value. Meloy, G. S., The Cotton Oil Press, May 1928, p. 28, and June 1929, p. 43.

The *Repetends* are the percentages of oil, of ammonia, and of tare which cause a unit change in the index, and by which the difference between the percentage of these factors, as found by analysis, and the corresponding percentages in the Basis Seed Analysis, may be divided to determine the total change in the index.

Let a = Reciprocal
" b = Radical
" c = Repetend for oil
" d = Repetend for ammonia
" e = % discount on account of F. F. A.
" f = Change in Index on account of oil
" g = Change in Index on account of ammonia
" h = Change in Index on account of tare
and the following formulae may be used to advantage:

(1) $\frac{\text{Price of pound of oil}}{\text{Price of pound of 8\% cake}} = b$

(2) $\frac{(\%\ \text{oil} \times 2000)}{100} + \frac{(\%\ NH_3 \times 2000)}{8/b} = a$

(3) $\frac{a}{2000} = c$

(4) $\frac{8ab \div 100}{2000} = d$

(5) $10\ (\%\ \text{F.F.A.} - 2) \times .3 = e$

(6) $\left\{\begin{matrix}\%\text{ of oil}\\ \text{As is seed}\end{matrix}\right\} : (2000 - \text{Excess tare}) :: \left\{\begin{matrix}\%\text{ of oil}\\ \text{Standard tare}\end{matrix}\right\} : (2000)$

(7) $\left\{\begin{matrix}\%\text{ of } NH_3\\ \text{As is seed}\end{matrix}\right\} : (2000 - \text{Excess tare}) :: \left\{\begin{matrix}\%\text{ of } NH_3\\ \text{Standard tare}\end{matrix}\right\} : (2000)$

(8) $\frac{(\%\ \text{oil} - 19.00)}{c} = +f$

(9) $\frac{(19.00 - \%\ \text{oil})}{c} = -f$

(10) $\frac{(\%\ NH_3 - 3.50)}{d} = +g$

(11) $\frac{(3.50 - \%\ NH_3)}{d} = -g$

(12) $(11.00 - \text{actual tare}) = +h$

(13) $(\text{actual tare} - 11) = -h$

(14) $100 \pm f \pm g \pm h = \text{Index}$

(15) $\text{Index} \times (100\% - e) = \text{Qualitative Index of value.}$

The above formulae may be used to make the following determinations.

No. 1 to determine the radical on any market.

No. 2 to determine the basis reciprocal on any market.

No. 3 to determine the percentage of oil in relation to the base 19.00%, causing a unit change in the index.

No. 4 to determine the percentage of ammonia in relation to the base 3.50%, causing a unit change in the index.

No. 5 to determine the percentage of discounts.

No. 6 & 7 to reduce "as is" determinations to the basis of the standard tare.

No. 8 & 9 to determine the number of units of change in the index on account of oil.

No. 10 & 11 to determine the number of units of change in the index on account of ammonia.

No. 12 & 13 to determine the number of units of change in the index on account of tare other than standard.

No. 14 to determine the final index based on oil, ammonia and tare.

No. 15 to determine the relation to the basis quotation on account of both the quantitative and the qualitative analyses.

In previous discussions we have found that over a period of years the radical has averaged 5, which figure has been used in determining the reciprocal, 555, that has been used as par, or Index 100. In normal seasons there would probably be no criticism to the constant use of the radical 5, but in seasons such as the present when the price of oil is low and the price of cake is relatively high, possibly the actual radical should be used. With 7 cent oil and $35.00 cake the radical is 4.00. Using the radical 4.00 gives a reciprocal of 598.7 as index 100. In other words our standard or Basis Seed analysis would be

Oil		NH_3		Tare		Reciprocal		Index
19.00	—	3.50	—	11	=	598.7	=	100

This would change the repetends for oil and for ammonia but not for tare.

The repetend for oil would be $\frac{598.7}{2000} = .2993$

and for ammonia $\frac{(598.7 \times 8 \times 4.00)}{100} \div 2000 = .0958$

A few examples might help to an understanding of the theory. First let us consider the extremes of the probable variations in the prices of oil and cake. For example what is the index in seed analyzing 20.00% oil, 3.70% ammonia and 11% tare?

(a) when oil is 7 cents and cake $35.00
(b) when oil is 10 cents and cake $40.00
(c) when oil is 13.5 cents and cake $45.00

From formulae Nos. 2, 3 and 4 we find first as follows:

	Radical	Reciprocal	Repetends Oil	Repetends NH_3
(a)	4.00	598.75	.2993	.0958
(b)	5.00	555.00	.2775	.1110
(c)	6.00	525.83	.2629	.1262

Example (a) $\frac{20.00 - 19.00}{.2993} = 3.3$ Plus 3.3 on account of oil

$\frac{3.70 - 3.50}{.0958} = 2.0$ Plus 5.3 on account of ammonia

— on account of tare

or Index 105.3

Example (b) $\frac{20.00 - 19.00}{.2775} = 3.6$ Plus 3.6 on account of oil

$\frac{3.70 - 3.50}{.111} = 1.8$ Plus 5.4 on account of ammonia

or Index 105.4

Example (c) $\frac{20.00 - 19.00}{.2629} = 3.8$ Plus 3.8 on account of oil

$\frac{3.70 - 3.50}{.1262} = 1.5$ Plus 5.3 on account of ammonia

or Index 105.3

The repetends are variable and properly so since they represent the weight to be given to each of the two items, oil and ammonia, in the determination of the index of seed under varying prices of the products. When the value of oil is low, relative to the value of cake, more oil and less cake effects a unit change in the index, than is the case when the value of oil is high relative to the value of cake.

One other example of the use of repetends in discovering the quantitative index of cotton seed, might clarify the proposed plan.

For example, suppose the report of the chemists shows that, on the basis of the standard tare, a certain lot of seed analyze 20.11% oil, 3.056% ammonia and that the actual tare was 16%; what is the quantitative index when the radical is 5?

By formula No. 8
20.11 minus 19 equals 1.111
which divided by the oil repetend .2775 gives ..... plus 4.0 on oil
By formula No. 11
3.50 minus 3.056 equals .444
which divided by the ammonia repetend .111 gives ..... minus 4.0 on ammonia
By formula No. 12
16 minus 11 equals ..... minus 5.0 on tare
By formula No. 14
100 plus 4, minus 4, minus 5, equals index 95

Proof:

The analysis is basis standard tare 11, actual tare is 16. Therefore the quantity of seed at standard tare is 1900 pounds, which will produce 725.8 pounds of 8% cake which divided by the radical 5 gives 145.16 as the number to be added to the indicated pounds of oil.

1900 pounds seed at 20.11% oil gives ..... 382.09 pounds of oil
add ammonia converted to oil as above 145.16

Divide by standard reciprocal ..... 555) 527.25

95 (Index)

Or the example may be proved by first converting the analysis, from the basis of standard tare, to the basis of the actual tare. Using formulae 6 and 7, the analysis would be

19.1045% oil — 2.90032% NH_3 — 16% tare

This analysis on the basis of 2000 pounds to the ton will give ..... 382.09 pounds of oil and 8% cake divided by 5 ..... 145.16

Reciprocal 527.25

527.25 divided by 555 gives index of 95.0

If this sample also analyzed 5% Free Fatty Acids by formula No. 5 we find the discount to be 9%

$$10\ (5 - 2) \times .3 = 9.00$$

And by formula No. 15 that the qualitative index is 86.45

$$95 \times (100 - 9) = 86.45$$

The index method of evaluating cotton seed would, of course, be much simplified if the use of a constant radical can be justified. The limits of the variation of the radical during a ten year period, including the immediate post war period, has been shown to extend from 4.00 to 6.00*.

The radical 4.00 gives a basis reciprocal of 598.7. The radical 5.00 gives a basis reciprocal of 555.0. The radical 6.00 gives a basis reciprocal of 525.8. When the basis reciprocal is 598.7 the repetend for oil is .2993%. When the basis reciprocal is 555.0 the repetend for oil is .2775%. When the basis reciprocal is 525.8 the repetend for oil is .2629%.

The maximum deviation from the repetend of the suggested constant is .0218% of oil, which is well within the usual error of check analyses of cotton seed. In addition this error represents .436 pounds of oil per ton of seed, which when oil is 10 cents a pound amounts to 4.36 cents error per ton of seed. Moreover, the variation in price relations during a season would doubtless result in plus and minus errors that would average or balance during each season. There appears, therefore, to be no reason why a constant radical cannot be used with the resulting constant basis reciprocal.

The adoption of a constant radical makes possible the use of a simple table of analyses from which the index of any lot of seed may be seen at a glance, provided the analyses for oil and ammonia are calculated and reported on a constant tare and the actual tare is determined. Table I is such a table in which the figures in each column above the basis analysis result in plus changes in the index, and those below the basis analysis minus changes. The three columns, oil, ammonia and tare, may com-

*The Cotton Oil Press, May 1928, page 24.

plement or offset each other in the resulting index. They complement as in a-a-a-a and b-b-b-b. They offset as in c-c-c-c and d-d-d-d.

Table II shows the index of seed containing excesses of Free Fatty Acids. The quantitative index is found first, as in Table I; then the discount is applied as in Table II.

TABLE I

TABLE OF ANALYSES
SHOWING THE QUANTITATIVE INDEX
Analyses

	% Oil (Basis Standard Tare)		% Ammonia		% Tare (Actual)		Index	
	21.77		4.61		1		110	
	21.49		4.49		2		109	
	21.22		4.38		3		108	
	20.94		4.27		4		107	
	20.66		4.16		5		106	
	20.38		4.05		6		105(a)	
	20.11(c)		3.94		7		104	
	19.83(a)		3.83		8		103	
	19.55		3.72(d)		9		102	
	19.27(d)		3.61(a)		10(a)		101	
B	19.00	A	3.50	S	11(c)	I	100(c)	S
	18.72		3.38		12		99(d)	
	18.44(b)		3.27(b)		13(b)		98	
	18.16		3.16		14		97	
	17.89		3.05(c)		15(d)		96	
	17.61		2.94		16		95	
	17.33		2.83		17		94(b)	
	17.05		2.72		18		93	
	16.78		2.61		19		92	
	16.50		2.50		20		91	
	16.22		2.39		21		90	

TABLE II

TABLE SHOWING THE APPLICATION OF DISCOUNTS ON ACCOUNT OF EXCESSES OF FREE FATTY ACIDS.*

The Index of Seed Containing not over	The Index of seed containing excesses of Free Fatty Acids.							
2% Free Fatty Acids.	2.1%	2.2%	2.3%	2.4%	2.5%	3.0%	4.0%	*18.5
110	109.6	109.3	109.0	108.6	108.3	106.7	103.4	*55.5
109	108.6	108.3	108.0	107.6	107.3	105.7	102.4	55.0
108	107.6	107.3	107.0	106.7	106.3	104.7	101.5	54.5
107	106.6	106.3	106.0	105.7	105.3	103.7	100.5	54.0
106	105.6	105.3	105.0	104.7	104.4	102.8	99.6	53.5
105	104.6	104.3	104.0	103.7	103.4	101.8	98.7	53.0
104	103.6	103.3	103.0	102.7	102.4	100.8	97.7	52.5
103	102.6	102.3	102.0	101.7	101.4	99.9	96.8	52.0
102	101.6	101.3	101.0	100.7	100.4	98.9	95.8	51.5
101	100.6	100.3	100.0	99.7	99.4	97.9	94.9	51.0
100	99.7	99.4	99.1	98.8	98.5	97.0	94.0	50.5
99	98.7	98.4	98.1	97.8	97.5	95.0	93.0	49.9
98	97.7	97.4	97.1	96.8	96.5	95.0	92.1	49.4
97	96.7	96.4	96.1	95.8	95.5	94.0	91.1	48.9
96	95.7	95.4	95.1	94.8	94.5	93.1	90.2	48.4
95	94.7	94.4	94.1	93.8	93.5	92.1	89.3	47.9
94	93.7	93.4	93.1	92.8	92.5	91.1	88.3	47.4
93	92.7	92.4	92.1	91.8	91.6	90.2	87.4	46.9
92	91.7	91.4	91.1	90.8	90.6	89.2	86.4	46.4
91	90.7	90.4	90.1	89.9	89.6	88.2	85.5	45.9
90	89.7	89.4	89.1	88.9	88.6	87.3	84.6	45.4

*First determine the index as if there were no excess of Free Fatty Acids and then read across to the index under the percentage of acidity as reported in the analysis.

Oil Chemists' Annual Meeting

Twenty-first Successive Yearly Gathering to be Held at Hotel Roosevelt, May Eighth and Ninth

THE twenty-first annual convention of The American Oil Chemists' Society will be held at the Hotel Roosevelt, New Orleans, Louisiana, on Thursday and Friday, May Eighth and Ninth. President W. R. Stryker has arranged a program of exceptional interest to all oil and soap chemists, and a large attendance is expected.

Among many papers and addresses to be presented are included a paper on Rubberseed Oil by Dr. George S. Jamieson, Chief of the Oil, Fat and Wax Laboratory of the Bureau of Chemistry and Soils, U. S. Department of Agriculture; a paper on Methods for Analyses of Cottonseed, also by Dr. Jamieson; a paper, Studies on Gossypol, by Dr. E. P. Clarke, Research Associate, Cottonseed Products Association; Address—Chemical Resources of Louisiana, by Professor Charles S. Williamson, Jr., of Tulane University and many others.

Committee Reports

FULL reports of all standing and special committees of the Society will be presented, including reports of: the Referee Board, Smalley Foundation, Governing Committee, Membership Committee, Soap Section, Crude Mill Operations Committee, Refining Committee, Olive Oil Committee, Detergent Committee, Planning and Uniform Methods Committee, Joint Committee on Fat Analysis of the American Oil Chemists' Society and the American Chemical Society, Committee on Publication of Methods; and other committees covering all phases of the Society's manifold activities.

Social Features

AS IN former years, the convention will be accompanied by attractive social features, so enjoyable in hospitable New Orleans with its true Creole charm.

A golf tournament will be held, of course, to decide what member will be the holder during the coming year of the Challenge Cup donated last year by The Industrial Chemical Sales Co. There will be many handsome prizes for the consolation of those entrants who compete in the golf tournament, but just fail to win the cup. It will be remembered that the Challenge Cup was donated last year and is to become the permanent property of any contestant who shall win it three times, not necessarily consecutively.

Roosevelt Hotel, New Orleans, convention headquarters for the 21st Annual Meeting of the American Oil Chemists' Society

The Annual Banquet will offer an opportunity for the renewal of old friendships and the formation of new ones, and a program of appropriate entertainment is assured.

Special arrangements are being completed for the entertainment of ladies who attend the convention, therefore all members and guests are urged to bring their wives and daughters.

All who attend the convention of the Oil Chemists' Society and the National Cottonseed Products Convention, which will be held at the same place during the following week, will be able to avail themselves of the special rate of one and one-half one-way fares for the round trip, which will be offered by all railroads for the latter convention. Particulars may be obtained from your local railway ticket agent.

Cod Liver Oil and the Vitamin Theory

Presented before the Fall Meeting of the American Oil Chemists' Society in New York, November 15, 1929

By Arthur D. Holmes

THE term vitamin was coined by Casimir Funk[1] as a descriptive name for a substance or substances which he believed were vital to health and which he believed contained nitrogen as an amine. Hence he combined the two words vital amine and coined the "vitamine." The work of Eijkman[2] on the effect of the presence or absence of rice polishing in the diet of pigeons and the work of Hopkins[3] on the effect of the presence or absence of milk as a supplement to his purified ration for rats were precursors to the discovery of vitamin B and vitamin A. These investigations preceded Funk's studies by several years. In the years that followed, investigators in this country and abroad have conducted numerous vitamin investigations until now the literature contains hundreds of scientific papers reporting vitamin studies. As a result some six or seven vitamins have been described. All of these are reported to be essential for regulating or stimulating some special phase of human or animal metabolism. However, five of the vitamins have been more completely studied and are better known than the others. These are vitamin A—antiophthalmic; vitamin B—antineuritic; vitamin C—antiscorbutic; vitamin D—antirachitic; vitamin E—antisterility.

Vitamin A has been variously termed the antiophthalmic and the growth promoting vitamin. It performs both functions. When the vitamin A is inadequate or lacking from the diet, a particular type of eye trouble, characteristic of this dietary deficiency, develops and growth is retarded or stopped altogether. The antiophthalmic and growth promoting functions have been attributed to vitamin A for a relatively long time. More recently, other functions have been ascribed to vitamin A. It is now believed that vitamin A is of particular value for increasing the body's resistance to various types of infections and that a deficiency of vitamin A may cause a disturbance of reproductive functions and a degeneration of nerve tissue.

Vitamin B—antineuritic—must be continually present in the diet if one is to avoid various types of neuritic conditions. Vitamin B is a preventive for or a cure of a special neuritic condition know as "beri-beri" in humans and "polyneuritis" in chickens. During recent years, the substance originally known as vitamin B has been separated into two vitamins designated as vitamin B_1 and vitamin B_2 or as vitamin B and vitamin G.

Vitamin C— antiscorbutic—prevents scurvy or cures it if it is not too far advanced. When vitamin C is inadequate in amount or absent from the diet, scurvy results. Fortunately, however, vitamin C is very widely distributed in common food stuffs.

Vitamin D—antirachitic—is essential for stimulating and regulating mineral metabolism particularly calcium and phosphorus. Since the growth of the skeleton and teeth is in no small measure dependent on the proper metabolism of calcium and phosphorus, it is easy to understand the important role that this vitamin plays in the growth of children and young animals.

Vitamin E—antisterility vitamin—is believed to be essential for normal reproduction. When this vitamin is inadequate or lacking, conception may not take place, more frequently however pregnancy is inaugurated but the foetus dies sometime before normal term. The extent to which the lack of vitamin E may be responsible for premature human birth is a question which merits much careful attention. Also it requires very little imagination to appreciate the economic importance of normal reproduction in the live stock industry.

Vitamins in the Diet

THE relationship between vitamins and other constituents of the adequate diet may be compared to the relationship between the building materials and the workmen employed in building a house or similar structure. In fact,

the building of a house and the building of the human or animal body is quite similar in many respects. When building a house one obviously needs stones, bricks, lumber, cement, hardware, glass, and numerous other building materials. In addition it is necessary to have workmen. Similarly in building the human or animal body it is necessary to have various food constituents such as protein, fats, carbohydrates, and mineral matter and here also workmen or vitamins are needed. With plenty of building materials available and the workmen on a strike, no progress is made. Also with plenty of food constituents and no vitamins at hand, little progress is made in the growth and development of the human body. Efficient building operations require that workmen are specialists in some type of activity. In other words, one does not expect the paperhanger to do a mason's work in laying a cellar wall. Likewise, the various vitamins have their special functions. For instance, vitamin C, which is decidedly efficient for preventing or curing scurvy, is of little value for preventing or curing rickets. From this brief survey and analogy one can readily understand the necessity for care in selecting the diet of young growing children and the necessity for insisting that an adequate supply of vitamins is present to insure normal metabolism of the essential constituents of the dietary.

In considering the relationship of cod liver oil and the vitamin theory, attention is directed to the use of cod liver oil as a source of vitamin A and D. Obviously, an individual's dietary requirements for vitamin A and D begin at birth. In general, when considering their dietary needs, infants are classified as bottle-fed or breast-fed. Due probably in no small part to empirical observation it has been generally believed that the breast-fed infant is normally adequately nourished. As a result of this belief, numerous studies have been made of the nutritive value of cow's milk but very little study has been made of human milk. With the advent of the vitamin theory consideration was soon given to providing an adequate supply of vitamins as supplements to the modified milk formula. It became a rule to give infants orange juice to protect them against infantile scurvy and pediatricians regularly prescribed cod liver oil to compensentate for the low supply of vitamin A and vitamin D in cow's milk. More recently investigators of the nutritive value of breast milk have shown that the vitamin A content of human milk is quite variable and frequently not adequate for the infants' needs. Kennedy, Palmer and Schultz[4] have reported that the vitamin A content of human milk is dependent on the nature of the diet of the mother. From their extensive studies of breast milk Macy and Outhouse[5] have concluded that "Adjuvants rich in vitamin A, therefore, should be added early to the diet of the breast-fed as well as of the artificially-fed infant. This would not only protect against a widespread series of pathological changes, but would aid particularly in the promotion of optimal well-being."

Results of Vitamin Deficiency

FROM the foregoing the importance of vitamin A as a growth-promoting vitamin can be appreciated. However, vitamin A has other important functions. Numerous investigators have noted that vitamin A deficiency is frequently followed by a lowered body resistance to various types of infections. Werkman[6] found that rats and rabbits which had been maintained on diets low in vitamin A were less resistant to anthrax bacillus and pneumococcus than animals given an adequate supply of this vitamin. Daniels, Armstrong, and Hutton[7] noted that laboratory animals which received vitamin A low diets were predisposed towards infections of the nasal and aural passages. Dean[8] believes that generous vitamin A feeding is indicated for the treatment of paranasal sinusitis in children. Sherman and Burtis[9] reared groups of albino rats under conditions identical except as regards the vitamin A content of the diet. In translating the results of their studies into human life, the authors conclude that their results indicate "the differences of incidence to infections to be expected of children around ten to twelve years result from differences in the way they were fed before they were three years old."

It has been noted that long continued vitamin A deficiency in adults may occasion a disturbance of the normal functioning of the reproductive organs and in some instances nerve degeneration has also followed vitamin A deficiency. Hence it appears that one should make adequate provision for vitamin A to meet the body's needs at all stages of one's existence. Attention[5] has been called to the fact "that in the United States one may be dealing with dietaries not wholly devoid of vitamin A and one may not be confronted with the gross pathologic process of xerophthalmia, but rather with borderline conditions such as anorexia, cessation of growth, gastro-intestinal disturbances and susceptibility to infection of the nasal sinus, middle ear and mastoid. In the absence of well defined physical or bacterial causes, such symptoms may be significant of an appreciable deficiency of vitamin A in the diet."

Nearly three centuries ago[10] Glisson identified rickets and for more than a hundred years it has been known that cod liver oil was particularly efficacious for the treatment of rickets. However, it was not until after the advent of the vitamin theory and the recognition of the action and function of vitamin D that a clear understanding developed concerning the role of cod liver oil in the treatment of rickets. Since the mineral portion of bone consists principally of calcium and phosphorus, in order to secure satisfactory bone development, it is essential that the diet should supply sufficient amounts of calcium and phosphorus to provide for bone structure. However, with an adequate amount of calcium and phosphorus present, if vitamin D is inadequate or absent from the diet there is insufficient utilization of calcium and phosphorus for forming normal bones and teeth. This type of malnutrition is known as rickets and afflicts children and young animals. Vitamin D is essential not only during the stages of active growth but during later life. In case of bone repair as following a fracture or after bone surgery, it is essential that an adequate amount of calcium, phosphorus and vitamin D be provided.

McCollum[11] and Peterson[12] have reported that it is essential in the treatment of non-union fractures to give careful attention to the vitamin content of the diet. In their studies, these authors obtained excellent results by supplementing the diet with calcium carbonate and cod liver oil. The results obtained were very significant—"Out of twenty patients with fractures of long standing who were treated according to this plan, eighteen secured satisfactory unions. The remaining two cases were handicapped by complications arising from infections." From time to time it has been noted clinically that breast-fed infants develop rickets. Accordingly, it is now recognized that human milk is a doubtful source of the antirachitic vitamin. As a consequence, it has become a quite general routine practice for pediatricians to prescribe cod liver oil as a source of vitamin D to supplement the dietary of both breast and artificially-fed infants.

Nature of Vitamin D

DURING the past five years, considerable research work has been directed towards determining the nature of vitamin D and it has been found that a number of edible oils acquire antirachitic activity when irradiated under controlled conditions with ultraviolet lights of certain wave lengths. The earlier studies seemed to indicate that the cholesterol present in fats was responsible for the development of antirachitic potency in irradiated fats. The effectiveness of sunshine in preventing or curing rickets was explained as resulting from the irradiation of the cholesterol in the human fat in the skin by the natural ultra-violet light in the sunshine. This explanation, however, was short-lived for soon the brilliant researches of Hess[13], Rosenheim[14], Steenbock[15], Webster[16], and Windaus[17] showed that minute amounts of ergosterol were associated with cholesterol as it was distributed in natural products. These investigators also showed that it was the ergosterol that became active when treated with ultraviolet light. They found that ergosterol, when prepared in the pure form, was a white crystalline substance, which if treated with ultraviolet light under proper conditions acquired antirachitic properties. When the irradiated ergosterol was fed to rachitic albino rats it was found to possess heretofore unheard-of calcifying value. As soon as the significance of these discoveries was appreciated, attempts were made to produce this material on a commercial scale. As a consequence, there has recently appeared on the market various preparations under the name of "Viosterol" designed to be used in the prophylactic or curative treatment of rickets in the place of cod liver oil. However, a careful comparison of viosterol and cod liver oil shows that while both may be used as antirachitic agents their functions and values are quite different.

The irradiated ergosterol preparations are extremely potent calcifying agents. Accordingly, in the treatment of rickets it is possible to administer therapeutic amounts of irradiated ergosterol by drops even when the irradiated ergosterol has been many times diluted with corn or other vegetable oils. Thus if one wishes to secure rapid calcification, the irradiated ergosterol preparations are extremely valuable products. But here the therapeutic value ends for irradiated ergosterol possesses no vitamin A value. Thus if one wishes to secure the beneficial action of vitamin A for increasing the body's resistance to infections and for insuring normal functioning of the body in other respects irradiated ergosterol is not indicated. On the other hand, as pointed out above, cod liver oil contains both vitamin A and vitamin D. Since its calcifying value is lower than that of irradiated ergosterol, viosterol, larger amounts are required to perform the same results. Thus cod liver oil is administered by the teaspoonful and viosterol by drops, but the necessity for larger amounts may in some instances be a blessing in disguise for there is little likelihood of an overdose of cod liver oil and evidence is at hand to show that the inges-

tion of too much irradiated ergosterol produces undesirable and sometimes disastrous results.

The condition for which the antirachitic factor is most definitely indicated is in the prevention or cure of rickets. It is generally agreed that the amount of the antirachitic factor required for the cure of rickets is very greatly in excess of the amount required for prophylactic use; thus it would at first appear that irradiated ergosterol was par excellence the substance to be used for this condition. However, it has been recognized for a long time that individuals afflicted with rickets were particularly susceptible to various types of infections. Hence it appears that in the treatment of rickets provision should be made for vitamin A as well as vitamin D. In this connection reference may be made to the investigations of Daniels[7] and coworkers who noted that the laboratory animals which they maintained on low calcium rations but to which they gave an adequate supply of vitamin A, failed to develop infections of the nasal and aural passages and this led them to conclude "that the well known low resistance in rickets is the result of a deficiency in the fat-soluble A vitamin or some substance associated with it and not to calcium deficiency."

Perhaps the value of cod liver oil in the treatment of rickets and some other diseases is not wholly due to its generous supply of vitamin A and vitamin D but may be due in part to the ratio of vitamin A to vitamin D which exists in cod liver oil. As early as 1923, Hopkins[18] suggested that a balance of the vitamins in the diet might be an important factor in the maintenance of normal health. Recently Hoyle[19] has suggested that "a degree of deficiency of vitamin A or excess of vitamin D, either of which acting separately might be quite inadequate to induce calculi formation, when acting together might well do so. Such a condition would illustrate clearly the significance of 'vitamin balance' in the case of the fat-soluble accessory factors." When the advent of viosterol, with its excessive antirachitic potency, there appears to be need for more conclusive evidence as to whether the upsetting of the ratio of vitamin A to vitamin D by the administration of relatively large amounts of the antirachitic factor is without significance or whether as suggested by Hoyle[19] the administration of large amounts of the antirachitic factor in conjunction with a low or perhaps deficient supply of vitamin A may be the cause of unexpected and disastrous results.

However, regardless of the outcome of questions of this character there now seems to be a satisfactory theory to account for the efficacy that cod liver oil has enjoyed for generations. With the development of the vitamin theory and the accumulation of data concerning the role and function of vitamin A and vitamin D we have an explanation for the peculiar value that cod liver oil has had in the treatment of certain diseases and nutritional disorders. Hence we find the close relation that exists between the high therapeutic value that cod liver oil has enjoyed for ages and the vitamin theory which has developed with the last two decades.

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The quantity of decolorizing carbon shipped from the Netherlands to the United States during the first six months of 1929 aggregated 747,672 pounds, valued at $48,410 as compared with 394,352 pounds, valued at $30,440 during the corresponding period of 1928.

A. E. Starkie, sales manager of soap making oils and fats for Glidden Food Products Co., for the past eight years, joined the Acme Oil Corp., 800 N. Clark St., Chicago, in the same capacity, as directing vice-president, on Jan. 1.

Sharples Separator Co., West Chester, Pa., is now distributing an eight-page folder describing the Sharples Super-Centrifugals for use in oil purification and reclamation. The Sharples machines are used in a number of industries to remove particles of foreign matter, impurities and moisture from oils.

American Can Co. and Thermokept Corporation are cooperating with English interests in the formation of the British Can Co., which has acquired the business of Ernest Taylor, Ltd., of Liverpool, H. W. Phelps, president of the American Can Co., and Harry Craver, vice-president, will be directors of the new company and other American members of the board include Robert M. McMullen, chairman of the Thermokept Corporation, and George K. Morrow, chairman of the United Cigar Stores Corporation and Gold Dust Corporation.

Excess stocks of olive oil in Spain were responsible for a recent conference of Spanish olive oil producers in Madrid. They propose the following measures to relieve the situation: Compilation of statistical data to show world production and prices, confining of propaganda to organize producers, advertising among medical authorities as to the hygienic and alimentary properties of olive oil, and prohibition of manufacture of oils from imported nuts and seeds.

Considerable interest is being exhibited throughout the world in the forthcoming German "Great Exhibition of Chemical Apparatus, ACHEMA VI" organized by the Deutsche Gesellschaft für chemisches Apparatewesen E.V., which is to be held at Frankfort a/Main from June 10 to 22, 1930. The sponsors of the exhibition expect visitors representing the chemical industries of the major countries of Europe, America and Asia.

The National Tung Oil Company, a new $1,000,000 corporation with headquarters in Chicago, is reported to have purchased 10,000 acres at Bond, near Wiggins, Mississippi, upon which tung trees will be planted this year.

The area sown to rapeseed and mustard seed in India for 1929-30 is reported to be 3,372,000 acres, compared with 3,073,00 acres reported at the same time last year. The final report for last season, however was 6,823,000 acres.

Senate Passes Tariff Bill

BY A vote of 53 to 31 the Senate passed the tariff bill on March 22. Voting for the bill were 46 Republican and 7 Democrats with 5 Republicans and 26 Democrats opposed. Although the bill has been under consideration for more than a year, the differences between the Senate and House Bills as passed is such that it is believed almost a month of conference between the houses will be required before these differences are finally adjusted. Consequently it may be expected that the measure will not become law until sometime during the latter part of April or the early part of May.

The dairy and allied interests made a final desperate drive upon the retention of certain industrial oils and fats on the free list. An amendment seeking to remove all of these oils and fats from the free list was offered by Senator Sheppard, (Dem.) of Texas, but was defeated by a vote of 39 to 28. A study of this vote in detail and a comparison with the vote on the Thomas amendment offered on January 28, reveals that six of the Senators who voted in favor of the Thomas amendment either voted against the Sheppard amendment to put duties on industrial fats and oils, or in one instance, refrained from voting at all. On the other hand, six Senators who voted against the Thomas amendment changed their stand when the Sheppard amendment came to a vote and aligned themselves with the people who wanted to put duties on all industrial fats and oils.

The Tariff Bill now goes to conference with the rates on all oils and fats and oilseeds virtually the same as in the Tariff Act of 1922, with the exception of the 4½c per pound tariff on linseed oil in the Senate Bill as compared to 4.16c in the House Bill and 3.7c per pound in the existing tariff. On soya bean oil, the present duty is 2½c per pound, whereas the Senate Bill carries 2.8c per pound. Rapeseed oil is on the free list in the Senate Bill, if denatured. Palm kernel oil, sesame oil sunflower oil and olive oil may be brought in duty free, if denatured, which in one sense maintains the status quo of 1922, although all these oils bear duties unless denatured (under the Senate Bill). Tallow remains at the 1922 rate of ½c per pound, and vegetable tallow remains on the free list. Copra, sesame seed, palm kernels and all other oilseeds formerly on the free list retain that classification, with two additions to the list, namely, kapok seed and rubber seed. China wood oil and perilla oil remain on the free list, as do palm oil, cod oil, cod liver oil, etc. Fish cake and fish meal are on the free list, but oil cake and meal made from oilseeds draw a duty of $6.00 per ton in the Senate Bill, although they are on the free list in the House Bill. The Conference Committee can therefore, if they wish, restore these items to the free list.

All sea animal oils bear the 1922 rates of duty with the exception of refined and crude sperm oils, the duty on the refined sperm oil having been put at 12c per gallon and that on the crude oil at 6c per gallon in the Senate Bill, as compared to 10c per gallon on both crude and refined oils in the Act of 1922.

Mixed Oils Duties

ANOTHER attempt to apply the linseed oil duty to a mixed drying oil has been determined upon by the Bureau of Customs.

F. X. A. Eble, Commissioner of Customs, has instructed the collector of customs at New York that shipments consisting of 95 percent of linseed oil and 5 percent of soya bean oil are to be assessed for duty as linseed oil at 3.7 cents per pound, under paragraph 54 of the tariff act of 1922, instead of as a mixed oil at 25 percent under paragraph 58. In the Thomas case, decided by the United States Court of Customs Appeals November 14, 1927 (T. D. 42473), it was held that such a mixture should be entered under the mixed oils paragraph.

Lately various customs appraisers have been in disagreement over the classification of such mixed oils, some holding that, if an analysis shows that the mixture conforms to the American Society for Testing Materials specification for raw linseed oil, it should be dutiable as linseed oil. Commissioner Eble declared that after careful consideration the bureau had concluded that the mixed oil paragraph should be limited to combinations of oils which produce an entirely different article than existed prior to the mixing, but that it has been established that a mixture of 95 percent of linseed oil and 5 percent soya bean oil is used for the same purposes as linseed oil.

The bureau expect that the matter will again be taken to the courts, but that new evidence will be presented that was not available in the Thomas case.

Notes of the Industry

New P & G Sales Districts

Procter & Gamble Co. have created two new sales districts on the Pacific Coast. The first is the San Francisco district covering the state of California, Clark County, Nevada, and the Hawaiian Islands. The second is the Seattle district which covers the states of Washington, Oregon, and a few counties in Idaho and Nevada. The announcement of these new districts follows closely that of the new $5,000,000 plant at Long Beach, Cal. They have been established to provided for closer supervision of the expanding business of P. & G. on the Pacific Coast.

A bill to make it a felony for any person or firm to enter into any agreement for the purpose of controlling prices of cotton or cottonseed, whether dealing in the actual commodity or in futures contracts, which has the effect of depressing or of decreasing the prices of cotton or cottonseed has been introduced in the House by Representative Charles H. Brand of Georgia.

Spencer Kellogg & Sons reports for the first twelve weeks of the fiscal year ended December 21, 1929, net profits of $267,468 after charges and Federal taxes, equivalent to 48c a share on 550,000 no-par shares. This compares with $182,777, or 36 cents a share, on 500,000 shares in the corresponding preceding period.

Procter & Gamble reports for the six months ended December 31, 1929, net earnings of $11,639,819 after charges for depreciation, taxes and advertising. This compares with earnings of $9,574,496, representing one-half of the company's net earnings in the twelve months of its fiscal year ended June 30. Total net earnings in that fiscal year were $19,148,993.

McCormick and Co. of Baltimore, well known manufacturers of mayonnaise and of flavoring extracts and spices, have issued an attractive booklet for the housewife, giving many new recipes for the use of their products. The title of the booklet is "Flavor and Spice and All Things Nice."

Glidden Increases Stock

Stockholders of the Glidden Company, Cleveland, have approved the proposed increase in the authorized capital stock from 700,000 to 800,000 no-par shares. Authority was granted the directors to dispose of additional stock from time to time to employees, also for corporate purposes.

Howard Beatty, general manager and vice-president of Durkee Famous Foods, Inc., a subsidiary, and Carl A. Baumann, vice-president in charge of Durkee sales, have been elected directors of the Glidden Company.

In connection with the recent move of Container Corp. of America, Chicago, in taking over Sefton Manufacturing Corp., Chicago, and Dixon Board Mills, Carthage, Ill., the following details have recently been made public: The Sefton Company manufactures a full line of corrugated fibreboard products, paper pails and folding boxes. The entire personnel of the Sefton Container Corporation will be taken into the Container Corporation of America. The operation of Dixon Mills will be completely absorbed into Container Corporation of America. Mr. Dixon will be President of the Sefton Container Corporation and a Vice President of the Container Corporation of America, as well as a Director and a member of the Executive Committee of the Container Corporation.

Unilever, Ltd., has recently concluded arrangements with Lilleborg Soap Factory and Denofa Whale Oil Refineries, Norwegian concerns, which provided for a closer co-operation between the Norwegian and British interests in the Norwegian soap market. The Lilleborg company will buy one-half of Lever Bros'. independent soap business in Oslo, and an increase in the Lilleborg capital will be made from 3,000,000 kronen to 6,000,000 kronen

During 1929, the Newfoundland whale catch totalled 1,085 whales, 700 of them being sperm whales, and the output was 612,000 gallons of oil and 1,060 tons of guano, having a total value of $359,000, according to a report from Consul Warren at St. Johns, Newfoundland.

Swift Splits Stock 4 for 1

Stockholders of Swift & Co., at their annual meeting held in Chicago recently, approved plans to split the common stock on a four-for-one basis, exchanging four shares of new $25 par stock for each one share of $100 par stock. This brings the number of shares up to 6,000,000 as against 1,500,000. A dividend of 50c a share will be paid quarterly on the new issue, equivalent to the present dividend of $2 a share on the old stock.

Effective February 1st, A. E. Moeller Co. of 261 Sumpter St., Brooklyn, New York, manufacturers of thermometers, barometers, hydrometers, have been succeeded by the Moeller Instrument Company, Inc. The active ownership of the company and the management remains the same as in the past. The Moeller Instrument Company makes a full line of thermometers, hydrometers, and similar instruments, specializing in industrial thermometers of all types, including those with straight or angle stems, union or fixed connections.

Davidson Commission Co., Chicago, oil and fat brokers, recently issued a twelve-page pamphlet listing the high and low prices for fats, oils and allied products for the years 1919 through 1929.

The contract for the new, $5,000,000 Procter & Gamble plant in Long Beach, Cal., has recently been let, and construction will start in about two months. It is expected that it will take about one year to complete the plant.

Procter & Gamble Co. opened its 20th district office in Lincoln Bank Building, Louisville, Ky., early in January. The Louisville District Office had been temporarily located in Cincinnati.

At a recent meeting, the Board of Directors of the Mayonnaise Products Manufacturers Association endorsed the President of the Association, C. P. McCormick, to fill a vacancy on the Board of Directors of the Chamber of Commerce of the United States.

The second official forecast of the East Indian linseed crop predicts 2,332,000 acres as of March 17, representing fifteen percent reduction as compared with the second forecast of last year. The report has been forwarded by the U. S. Trade Commissioner at Calcutta.

Gold Dust Corporation and Subsidiaries, report for 1929 a net profit of $7,586,963 after all charges, equivalent to $4.03 a share on the 1,788,052 shares of common stock, which will be outstanding after the exchanges. The surplus as of Dec. 31, 1929 was $15,233,215. Current assets as of Dec. 31, 1929, were $33,771,864 and current liabilities $6,865,009 and current liabilities $6,865,009.

Imports of copra into the United States during the month of November, 1929, amounted to 39,444,551 lbs.; value $1,512,681. Cocoanut oil imports totaled 24,727,953 lbs.; value $1,641,203. The chief sources of supply were the Philippine Islands, French Oceania and British Malaya.

Minneapolis Traffic Association, recently filed at Washington a brief urging the Interstate Commerce Commission to reject 27 per cent reductions proposed by railroads in rates on cocoanut oil from the West Coast to dairy states. It is contended that immense annual importations of the oil, are a direct blow to the dairy and butter industries.

Over one-half of the 4,000 tons of olive oil foots produced in Tunisia is employed in the local manufacture of Castile soap. The caustic soda is imported chiefly from France. Imports were: 1914, 434 tons; 1926, 507 tons; 1927, 595 tons; and 1928, 507 tons. The soap, produced by a number of small manufacturers, is uneven in quality, and finds its only local outlet among the poor native classes of the population. About one half of the soap is exported, chiefly to Malta, Egypt and Tripoli.

Continental Can Company, Inc., reports net earnings of $8,967,703 for 1929, after all taxes, depreciation and other charges, equivalent after preferred dividends to $5.02 a share on 1,725,845 no-par common shares outstanding at the end of the year. This compares with $6,690,796 earned in 1928, or $4.35 a share on 1,459,991 common shares.

Construction will begin within a few days on foundation and basement for the $5,000,000 Procter & Gamble plant at Long Beach, Cal. Bids for this work have been forwarded to the home office at Cincinnati for consideration by S. M. Manly, chief engineer. When completed the new unit will take care of the company's growing business in the West and its export business to the Orient.

The mayonnaise manufacturers of the New England territory held a meeting recently for the discussion of trade practices. The meeting was sponsored by the Trade Practice Committee of the Mayonnaise Products Manufacturers Association, and was presided over by Otto Seidner, President of Otto Seidner, Inc.

The American Can Company has underwritten the cost of establishing the Mayonnaise Research Fellowship, for the study and investigation of all scientific aspects of mayonnaise manufacture. The Fellowship is a project of the Mayonnaise Products Manufacturers Association.

Ralph Wechsler, Technical Director of National Oil Products Co., addressed the New York Section of the American Association of Textile Chemists and Colorists at their March Meeting on March 28. His subject was "Application of Fluorides on Textiles."

Margarine Union, Ltd., at a recent extraordinary general stockholders' meeting held in London, unanimously adopted the new articles of association and approved the change of name of the company to Unilever, Ltd.

The import duties on oils in Venezuela have been increased as follows: unrefined olive oil from 1.25 to 2.50 bolivars per gross kilo, pure olive oil from 0.25 to 0.75 bolivar per gross kilo, corn oil and peanut oil from 0.25 bolivar and fifty percent of the duty to 0.75 bolivar per gross kilo. There is also a surtax of 56.65 percent of the duty on all imports into Venezuela. This surtax has been in effect for several years.

Glidden Company reports for February net sales of $2,906,967, compared with $2,415,793 in February, 1929. The company has applied to the New York Stock Exchange for permission to list 6886 additional shares of common stock without par value and has withdrawn its common stock from the Cleveland Stock Exchange.

According to figures reported to the United States Bureau of Internal Revenue by margarin manufacturers, production in January, compared with the output in January, 1929, was as follows:

	Pounds	
	1930	1929
Uncolored oleomargarin	31,021,542	28,029,386
Colored oleomargarin	1,518,491	1,444,230

H. W. Caldwell & Son Co., of Chicago, a Division of Link-Belt Co., announce the production of Standardized Drives for screw conveyors. The Caldwell Screw Conveyor Drive is made in two arrangegments, Type "C" and Type "D". The Type "C" Drive consists of two speed reductions from motor to Screw Conveyor, each through a high grade power transmission medium — a Link-Belt Silent Chain Drive fully enclosed in an oil-retaining steel casing, and an efficient worm gear speed reducer, designed to serve as a thrust end and screw conveyor drive. The Type "D" Drive consists of a direct coupled reducer, mounted with motor on unit base plate. This type of drive permits the selection of a Caldwell worm gear reducer according to horsepower rating, without regard to the size of the conveyor trough on which the drive is to be mounted.

Procter & Gamble Company has extended the option to J. P. Morgan & Co., which permits the purchase of 90,000 shares of common stock at $80 a share, to August 2 from February 12, according to Herbert G. French, vice-president of Procter & Gamble.

Copra Oil Refineries, Inc., has been incorporated in Philadelphia for the manufacture of coconut, vegetable and synthetic oils. The capital stock of the new corporation consists of fifty thousand shares of common stock, par value, ten dollars per share.

The proposed changes in the Rules of The New York Produce Exchange covering the new trading contracts for cottonseed oil futures, have been ratified at a meeting of the traders in cottonseed oil. As soon as preliminary arrangements are completed for licensed bonded warehouses for delivery purposes, the new type of contract will become effective.

Charles V. Bacon, Consulting Chemist, of New York City, recently delivered two lectures on petroleum, Diesel oils and lubrication at Brooklyn Polytechnic Institute, Brooklyn, New York.

Houston Laboratories, F. R. Robertson, Manager, have removed their office and laboratories from 215½ Main Street, to 1206½ Preston Avenue, Houston, Texas.

CHEAP for Quick Sale. Anderson Expeller. Address Box 476, care *Oil & Fat Industries*.

ABSTRACTS

David Wesson, *Abstract Editor*

The bromine-iodine number is said to be a suitable test for distinguishing between extracted and expressed cacao butter. The test must be very carefully applied in the absence of light and at constant temperature. The saponification number is reported useful in detecting foreign fats in cacao butter. *Chem. Umschau Fette, O., W. H.* 36,377-80 (1929).

The rate of reduction of methylene blue in a fat or oil when catalyzed by light may serve as a measure of the rate of reaction of the initial oxidative processes and may therefore be utilized to determine the relative susceptibilities of fats and oils to oxidation. *J. Ind. Eng. Chem., Anal. Ed.* 2,9-10 (1930), *Chem. Abstr.* 1930, p. 1237.

A pale linseed oil is produced by bringing one ton of raw linseed oil to 212° F., adding fifteen pounds of manganese linoleate previously dissolved in thirty pounds of warm turpentine, then blowing and boiling for four hours at 220° F. A quick-drying bright oil is obtained by heating one hundred pounds of raw oil for four to five hours at 300° F. with three pounds for manganese resinate. *Ind. Chemist* 5,403-5 (1929).

The specific conductivities of various fatty acids have been determined by the mirror-galvanometer method with an instrument the sensitivity of which was 10^8 amperes, inner resistance 23 ohms, 3x4 centimeter electrodes, 0.6 cm. distance. The results were tabulated and by expressing them in a formula it was found that the electric conductivity of all fatty acids is approximately alike at each of the two fundamental points, (melting pt. and boiling pt.) *Seifensieder-Ztg.* 56,345-7 (1929).

The mixture of alcohols obtainable from wool fat may be separated by extraction with methyl alcohol and subsequent extraction with a mixture of an ester and an alcohol. The waxy residue, when dissolved in and reprecipitated from the same alcohol-ester solvent, yields a pure hydroxycholesterol. Ger. Pat. No. 485,-198.

Free fatty acids in oils and fats are neutralized under pressure and heat with an alkylene oxide such as ethylene or propylene oxide, with or without a catalyst. The products may be esterified. Brit. Pat. No. 312,523.

The crude fatty acids of whale oil or fish oil may be bleached by dissolving in a volatile solvent and treating with strong sulfuric acid for such a time and at such a temperature that a small proportion of sulfonated acids is produced. Any undissolved material is separated from the solution of fatty acids and the volatile solvent is expelled. U. S. Pat. No. 1,740,012.

Animal or vegetable oils may be refined as follows: the oil or fat to be purified is treated with a solvent such as benzene or trichlorethylene and the mixture is subjected to the action of an aqueous alcoholic ammonia solution; the product thus formed is further mixed (preferably while warm), with about one per cent of sodium sulphate previously dissolved in ten times its quantity of aqueous alcoholic ammonia solution. The products form into layers on standing and may be readily separated. U. S. Pat. No. 1,729,809.

Recently patented cleansing compositions are prepared by treating the polymerization products of drying or semi-drying oils with the sulfonation products of naphtha or similar mineral oils. Ger. Pat. No. 484,129.

Soap described as a good dry-cleaning soap gave the following analysis:

Total fatty matter 82.4%
Total alkalies (K_2O) 12.4%
Free fatty matter 2.1% (Oleic acid)
Volatile 0.1% (Alcohol)
Water 3.0%

The soap was found to be entirely soluble in naphtha, benzol and methanol and to give a perfectly clear, bright yellow solution in naphtha or benzol. Such dry-cleaning soaps are generally prepared by potash saponification of double distilled oleic acid, using the cold process. *Brit. Soap Man.* 6, No. 62 3-6 (1930.

Shortening and Oil Prices

Prices of shortening and salad and cooking oils on Thursday, Mar. 20, 1930, based on sales made by member companies of the Shortening and Oil Division of the National Cottonseed Products Association, were as follows:

Shortening

North and Northeast:	Per lb.
Carlots, 26,000 lbs.	@10¾
3,500 lbs. and up	@11
Less than 3,500 lbs.	@11½
Southeast:	
3,500 lbs.	@10½
Less than 3,500 lbs.	@11
Southwest:	
Carlots, 26,000 lbs.	@10½
10,000 lbs. and up	@10⅝
Less than 10,000 lbs.	@11⅛
Pacific Coast:	@11¼

Salad Oil

North and Northeast:	
Carlots, 26,000 lbs.	@10½
5 bbls. and up	@10¾
1 to 4 bbls.	@11¼
South:	
Carlots, 26,000 lbs.	@10
Less than carlots	@10¾
Pacific Coast:	@10⅜

Cooking Oil—White

⅛c per lb. less than salad oil.

Cooking Oil—Yellow

¼c per lb. less than salad oil.

Wesson Addresses Chemical Society

David Wesson will address the Section on Chemical Education of the American Chemical Society at the Annual Fall Meeting, to be held in Atlanta during the second week in April. The subject of Dr. Wesson's address will be "The Cotton Crop and Food Supply." The address will be illustrated with motion pictures and the speaker will exhibit samples of meat substitute prepared from cottonseed. The samples will include sandwiches prepared from the new cottonseed "meat" product, so flavored as to be indistinguishable from ham sandwiches.

A Correction

In the March Issue of *Oil & Fat Industries*, it was reported that J. D. O'Keefe had been elected President of Wesson Oil and Snowdrift Co. We are now advised that our correspondent was in error and that Mr. O'Keefe was elected a member of the Board of Directors of the company, Mr. A. D. Geoghegan remaining in the Presidency, as heretofore.

Archer-Daniels-Midland Company reports for the quarter ended November 30 a net profit of $458,165, equal, after preferred dividends, to 71 cents a share on the common stock outstanding.

P. H. Manire, of the Marshall Cotton Oil Company, Marshall, Texas, has been named as chairman of the trade practice committee of fertilizer manufacturers in the eighth district of the National Fertilizer Association.

Fiji Islands Copra — 1929

A report from Consul Roberts at Suva, Fiji Islands states that exports of copra for the year 1929 amounted to 33,226 tons valued at $2,744,599 as compared with 27,947 tons valued at $2,760,542 exported during 1928. Coconuts are now coming into bearing on the island of Vitilevu—a region once completely overrun by the Levuama moth. The coconut industry is now reviving and there should be an increasing output of copra from year to year as new plantations and new areas come into bearing.

Probably the coconut planters of Fiji suffered the heaviest damage during the December hurricane. Estimates of the damage vary from 20 to 35 per cent of the 1930 production. All the planters report little damage to the trees. The wind bruised the young nuts and twisted the stems—the result of which will be that the young nuts will drop off the tree before maturing. On Taveuni, one planter estimates the total loss for the next two years to be from 30 to 35 per cent. One of the leading copra exporters after making a survey of the copra producing regions of the Fiji Islands estimated the loss to the industry at about 20 per cent of the normal production or 6,000 tons of copra during the year 1930. Throughout the last quarter of 1929 low prices prevailed in Fiji and the world's markets for copra. The high price for copra quoted in Levuka the principal shipping port of copra in the Fiji Islands was £15-0-0 per ton while the low price quoted was £14-0-0.

A report from Trade Commissioner Carlson at Oslo, Norway, dated March 1, 1930 states that another sale of whale oil for the season of 1930-31 brought the total sold to date up to three-fourths of the estimated total production of 2,200,000 barrels. The price was the same as reported for previous sales, £25 sterling per ton for best quality oil.

Prices

Candles, adamantine 6s 16 oz.			
20-set cases	**set.**	**.14½**	**.15¾**
40-set cases	**set.**	**.14**	**.14½**
Candles, paraffin, cs., 14 oz., case of 40 sets	**set.**	**.10**	**.10¼**
6s 14 oz., case of six cartons containing 36 sets	**set.**	**.11**	**.11¼**
6s 12 oz., 40 set cases	**set.**	**.09**	**.09¼**
6s 12 oz. cases of six cartons containing 36 sets	**set.**	**.10**	**.10¼**
Patent ends	**set.**	**.17¾**	**.18**
Stearin 6s 16 oz., plain, cases	**set.**	**.16¾**	**.17**
Castor, No. 1, bbls.	lb.	.12¼	.12½
No. 3, bbls.	lb.	.11¾	.12
Chinawood, bbls. or drs.	lb.	—	.11½
Coast, tanks, spot	lb.	—	.10¼
Futures	lb.	.10	.10¼
Coconut, Ceylon grade, bbls.	lb.	.07⅞	.08⅛
Coast, Tanks, Domestic White	lb.	.06¼	.06⅜
Cochin grade, bbls.	lb.	.08⅝	.08⅞
Manila, bbls.	lb.	.07⅞	.08⅛
Tanks, N. Y.	lb.	.06¾	.06⅞
Fatty acids, mill tanks	lb.	.09⅞	—
Cod, Newfoundland, bbls.	gal.	.52	.56
Copra, bags, coast	lb.	.03⅞	.04
Corn, tanks, mills	lb.	.07⅝	.07¾
Bbls., New York	lb.	.10	nom.
Refined, bbls.	lb.	.10½	nom.
Fatty acid	lb.	.07⅝	—
Cottonseed, crude, tanks, mills	lb.	.07¼	—
P. S. Y.	lb.	—	.08½
Fatty acids, mill, bbls.	lb.	.07⅞	—
Degras, domestic, bbls.	lb.	.03¾	.04½
English, bbls.	**lb.**	**.04½**	**.05**
German, bbls.	lb.	.03¼	.03¾
Neutral, domestic, bbls.	lb.	.07¾	.08½
English, bbls.	**lb.**	**.08**	**.09**
German, bbls.	**lb.**	**.07**	**.07½**
Greases, choice white, bbl. N. Y.	lb.	.06	.07¾
Yellow	lb.	.05⅜	.05¾
Brown	lb.	.05½	.05⅝
House	lb.	.05⅝	.05¾
Herring, coast tanks	gal.	—	nom.
Horse, bbls.	lb.	.09½	nom.
Lard, city, tierces	lb.	.10¼	—
Compound, tierces	lb.	.10¾	.11
Middle Western, tierces	lb.	.10½	—
Neutral, tierces	lb.	.12	—
Prime Western, tierces	lb.	.10¾	—
Lard oil, No. 1, bbls.	lb.	.10¼	—
No. 2, bbls.	lb.	.10	—
Extra bbls.	lb.	.11	—
No. 1, bbls.	lb.	.10⅝	—
Winter strained, bbls.	lb.	.11¾	—
Prime, bbls.	lb.	.13	—
Linseed Oil, boiled, tanks	lb.	.1380	—
Car lots, bbls.	lb.	.1460	—
Less car lots, bbls.	lb.	.1500	—
Less than 5 bbls.	lb.	.1520	.1540
Double boiled, less than 5 bbls.	lb.	.1570	.1600
Raw, tanks	lb.	.1340	—
Car lots, bbls.	lb.	.1420	—
Less car lots, bbls.	lb.	.1460	—
Less than 5 bbls.	lb.	.1500	—
Refined, bbls.	lb.	.1490	.1530
Varnish grades, bbls.	lb.	.1510	.1550
Linseed cake, bags	ton	33.00	33.50
Meal, bags	ton	35.00	—
Menhaden, crude, tanks, Baltimore	gal.	.45	nom.
Light pressed, bbls.	gal.	.58	.60
Yellow bleached, bbls.	gal.	.60	.62
White bleached, bbls.	gal.	.63	.65
Mustard, bbls.	gal.	.90	—
Neatsfoot, cold pressed, bbls.	lb.	.17¼	—
Extra, bbls.	lb.	.11	—
No. 1, bbls.	lb.	.10½	—
Pure, bbls.	lb.	.12½	—
Oleo, No. 1, bbls.	lb.	.12⅜	—
No. 2, bbls.	lb.	.10⅞	—
Olive, denatured, bbls. N. Y.	gal.	.75	.85
Shipments	gal.	.75	.80
Foots, bbls.	lb.	.07½	—
Shipments	lb.	.07	.07½
Edible, bbls.	lb.	2.00	2.40
Palm, Lagos, casks, spot	lb.	.07¼	.07⅜
Shipments	lb.	.06⅞	—
Niger, casks, spot	lb.	.06¾	.06⅞
Shipments	lb.	.06½	.06⅝
Palm Kernel, pkgs.	lb.	.07⅝	.07⅞
Tank cars	lb.	.07⅛	.07¼
Peanut, crude, bbls.	lb.	.09¼	.09¼
Mills, tanks	lb.	.07½	nom.
Refined, bbls.	lb.	.12½	.13
Perilla, bbl.	lb.	.12¾	.13
Poppy Seed, bbls.	gal.	1.70	—
Rapeseed, blown, bbls.	gal.	.92	.93
Refined, bbls.	lb.	.66	.67
Red Oil, distilled, bbls.	lb.	.10⅛	.10⅝
Tanks	lb.	.09¼	—
Saponified, bbls.	lb.	.10⅛	.10⅝
Tanks	lb.	.09¼	—
Salmon, coast, tanks	gal.	.44	nom.
Sardine, coast, tanks	gal.	.42½	nom.
Sesame, refined, drums	lb.	.12	.12½
Soya Bean, blown, bbls.	lb.	.11¾	.12
Crude, bbls.	lb.	.11¼	.11½
Orient, coast, tanks	lb.	.09¼	.09½
Sperm, bleached f.o.b., New Bedford, bbls.	**gal.**	**.84**	**.85**
Natural, f.o.b., New Bedford, bbls.	**gal.**	**.78**	**.80**
Stearic Acid, Double pressed, bags	lb.	.14½	.15
Triple pressed, bags	lb.	.16½	.17
Stearine oleo, bbls.	lb.	.08⅞	.09
Tallow, edible, bbls.	lb.	.07⅜	.07½
City, extra, works, loose	lb.	.06⅝	—
Special, works, loose	lb.	.06⅜	—
Tallow, oil, acidless, bbls.	lb.	.10	—
Tanks, N. Y.	lb.	.09¾	—
Vegetable tallow, coast, mats	lb.	.07⅛	—
Whale, crude, No. 1, coast, tanks	**lb.**	**.07**	—
No. 2, coast, tanks	**lb.**	**.06½**	—
Refined, winter bleached, bbls.	**gal.**	**.80**	—
Extra, bbls.	**gal.**	**.82**	—
Natural, bbls.	gal.	.78	—

Market Report on

FATS, OILS AND GREASES

(As of March 26, 1930)

NEW YORK—Although still on the decline, the various fats, oils and greases were steadier during the recent period than they have been for some time. Price reductions were not as numerous as they have been in recent months, and the revisions were for the most part only fractional concessions on the part of sellers. Sales were not reported in large volume, the buying being of the hand-to-mouth variety. The opinion was expressed that a number of buyers are waiting for the price curve to reach its low point and then start upward, planning to buy on the rise rather than buy heavily and then see further reductions in quotations a few weeks later. Coconut oil and copra were priced lower in the local market, at the close of the period, as were corn oil and crude cottonseed oil. Quotations on grease, lard and tallow were also fractionally lower again. Olive oil continued to be priced at recent low levels due to good supplies as a result of the recent large crop. Other fractional declines were noted in lard oil, tallow oil, neatsfoot oil and palm oil. The only two advances of any importance occurred in linseed oil and chinawood oil, the rise in the former being due to higher quotations on flax seed, while the advance in the latter oil came as the reflection of an advance in Chinese exchange.

Chinawood Oil

An upturn in Chinese exchange during the period was responsible for firmer conditions in the foreign market which in turn caused a firmer domestic market for chinawood oil. Offerings from abroad were not large, and, in spite of easy demand, quotations were advanced to 10¼c lb. for spot tanks on the coast. Barrels or drums were quoted locally at 11½c lb.

Coconut Oil

With demand showing no improvement over last period, coconut oil continued to be quoted at abnormally low levels. Manila tanks were quoted at 6¾c lb. inside, in the New York market, while copra was quoted at 3⅞c to 4c lb. on the coast.

Corn Oil

Corn oil quotations were reduced during the recent period in spite of the fact that the grain market has been stronger recently. Mill tanks declined to an inside price of 7⅝c lb., resulting in a decline in offerings from producers. Consumers showed no tendency to increase purchases even after the decline.

Cottonseed Oil

Quotations on cottonseed oil were lower during the early part of the period in line with the current movements in raw material and competing products. A recovery was noted toward the close, but it was not of sufficient force to wipe out the earlier reductions. Crude was quoted at 7¼c lb. at the close, with P. S. Y. oil at 8½c lb.

Grease

Further declines were noted in the greases, and quotations were at the lowest levels which have been recorded for the past year. Yellow and house grease were offered at 5⅝c lb., inside.

Lard

Price movements in the lard market were irregular during the period just closed. City tierces were offered at 10¼c lb. at the close, with lard compound at 10¾c lb.

Linseed Oil

An advance in the price of flax seed toward the close of the period brought a quick response from sellers of linseed oil, who advanced the schedule ½c lb. The rise in the price of flax seed was attributed to the aggressive entrance of seed houses into the market.

Tallow

Quotations on tallow were reduced approximately ¼c lb. during the period, edible tallow closing at 7⅜c lb., with city extra at 6⅝c. The market was fairly steady after the decline as offerings were reduced.

Gold Dust Corporation, New York, has filed notice with the New York Stock Exchange of a proposal to eliminate 7,045 shares of 6 per cent non-cumulative preferred stock and to increase the authorized preferred stock to 500,000 shares from 492,955.

OIL & FAT INDUSTRIES

The Editor's Page

Progress Through Fellowship

IN THE early years of the American Oil Chemists' Society, then known as The Society of Cotton Products Analysts, the scant handful of progressive chemists who fostered the organization received little encouragement from their employers, the oil millers, refiners and packers. The general attitude of the manufacturer was that chemists were a nuisance anyway, that his chemist might possibly know a trick or two beyond the ken of his fellows, and that there was more danger of competitors finding out those tricks than of his chemist learning anything by attending a meeting of others following the same specialized line of endeavor.

In spite, however, of this apathy on the part of those who could benefit most from it, the Society grew steadily, and chiefly because of the earnest efforts of a few devoted leaders, its accomplishments have been definite. The advance in quality of products produced and the reduction of operating cost which have been achieved in the milling and refining of oils, and in the manufacture of shortening, margarine, mayonnaise and allied products in this country during the past twenty years can be credited at least eighty-five percent to the American Oil Chemists Society.

The quality of analytical control work has been elevated to a plane of accuracy equal, if not superior, to that of any other branch of industry, and this has been achieved solely through the cooperative work between members and other oil and feed chemists, which work was started, fostered and developed, and is still continued by the Society.

Standard methods of analysis have been developed, tested by years of cooperative use and made available to all who may be interested by publication in convenient loose-leaf form. The importance of uniform reagent chemicals has not been overlooked with the result that oil chemists may obtain standard materials for several of their most important assays from the Society.

What force has been most potent in achieving these not insignificant results? As we consider the Society's progress, it seems to us that the most effective agency in its promotion has been simply *Friendship*. The men who have contributed most have been those who had friendly feeling for their fellows, those who were willing to share their discoveries with their friends and to extend a helping hand to others among their colleagues. No progress can be credited to those who are deterred from working for the common weal by jealousy, fear, suspicion of others, false pride or overmastering ambition.

Fortunately for the American Oil Chemists Society, the great majority of its members have always maintained an attitude of simple kindly goodfellowship toward all others. The meetings have attracted more and more attendants each year, largely, we believe, because of that very fellowship which pervades them.

The Churn—A Symbol

TIRELESS as the descent of Niagara, the river, and even louder than its roar, the blasts of the Dairy Interests continue to reverberate through the land, from the classic columns of Capitol Hill to the shaded dells of the Columbia and the writhing sands of the Snake.

The latest attack on margarine occurred on the Northwest Front, directing a spearhead thrust against the loosely-organized and little-drilled Retail-Grocers Division.

These poor little tradesmen, striving to gain a living in the most difficult retail business in America, are to be boycotted by the farmers unless they cease and desist from the iniquitous practice of trying to make a little profit out of the sale of a clean, wholesome food, margarine. This is indicative of the lengths to which the irresponsible politicians and lobbyists who claim to represent the farmer will go in their efforts to exclude unjustly a legitimate article of commerce from its markets.

As in the past, however, these efforts will fall short of the desired accomplishment. Already, the National Association of Retail Grocers, including in its membership more than eighty thousand of the country's most progressive grocers, has gone on record to the effect that "the butter farmer is behind the

times when he thinks that repressive legislation on margarine is going to increase butter consumption and clear his annual butter surplus."

The theory that margarine is responsible for the recent slump in the butter market has been definitely exploded by the fact that low butter prices have failed materially to increase the consumption of butter in American homes. "The real explanation" says the American Research Foundation, "lies in the general economic let-up that has affected countless other commodities in recent months." In spite of this apparent fact the "Defenders of the Churn" go on along their chosen path, that of vituperation of the margarine manufacturer and attempted intimidation of the wholesaler and retailer. In the face of all this antagonistic propaganda, the production and consumption of this nutritious food is increasing surely and steadily and will continue to increase as long as its makers pursue their present policy of offering the consuming public good value for its money.

The J. T. Baker Chemical Co. of Phillipsburg, New Jersey, manufacturers of Baker's Analyzed Chemicals, have opened a Sales Office at 1713 Sansome Street, Philadelphia. The new office will be in charge of Webster Rice, who has been covering the Philadelphia territory for the company for some time past.

Wilson and Bennett Manufacturing Co., manufacturers of steel barrels, drums and pails, announce the appointment of Harry C. Smith Co., Inc., as sales representatives in the territory of Tennessee and Arkansas.

Wesson Oil & Snowdrift Company reports for the six months ended February 28, a consolidated net profit of $1,447,059 after depreciation and taxes, which is equal after preferred dividends to $1.08 per share on 600,000 common shares.

The Churngold Corporation reports for 1929 a net income of $107,569, or $1.95 a share on the capital stock, compared with $97,941, or $1.76 a share, in 1928.

Provision has been made in the Peruvian customs regulations for a special import duty of 10 percent ad valorem on coconut oil, fish oil and coloring matter which is fat-soluble but insoluble in water. The special rate applies upon these commodities when imported in quantities of more than 500 gross kilos for use in Peruvian industries.

Lifetime employment with a guaranteed minimum average of 48 weeks' work each year, regardless of seasonal or cyclical business depressions, is an industrial ideal that has been made possible for more than 10,000 employees of The Procter & Gamble Company, as the result of the company's long and consistent use of advertising to control and stabilize its business. The foresight of Colonel William Cooper Procter, President of the Company, has made possible the plan now in operation, which has proved to be of benefit not only to employees, but to stockholders as well.

The Swan-Finch Oil Corporation has commenced construction of a compounding and shipping plant on a 2½ acre plot of ground at Newark, New Jersey, on the Passaic River. The land recently purchased there by the Corporation already has two large fireproof structures and several smaller brick buildings in place. These buildings will be utilized in connection with the new plant, in addition to the new construction. Upon completion of the new plant, all of the company's manufacturing operations will be conducted therein, the present location at Elizabeth, New Jersey being scheduled for abandonment.

Foreign Trade Opportunities

The Bureau of Foreign and Domestic Commerce of the Department of Commerce announces that its representatives in all parts of the world have forwarded the following trade inquiries of interest to our readers. In writing the Bureau in reference to any of these inquiries please mention that you saw it in *Oil & Fat Industries.*

No.	Location	Material	Purchase or Agency
44716	France	Animal Fats	Agency
44502	Venezuela	Lard	Agency
44586	Estonia	Oleo oils, etc.	Both
44837	Denmark	Red Oil	Both
44786	Norway	Soya oil and meal	Agency
44780	Canada	Salad Oil	Agency
44774	Ecuador	Inedible Tallows	Agency

Armour and Co. plan the erection of a new wholesale house in Washington, D. C., at a projected cost of $200,000.

Oil Chemists' Annual Convention

Full Program of Twenty-first Annual Meeting Hotel Roosevelt, New Orleans, May 8 and 9

THE Twenty-first Annual Meeting of The American Oil Chemists' Society will be held at Hotel Roosevelt, New Orleans, Louisiana, Thursday and Friday, May 8th and 9th, 1930. W. R. Stryker, President of the Society, has arranged a program for the Meeting which will be of the very highest interest to all the members and to all others interested in the chemistry and chemical engineering of oils, fats and soap.

In addition to the business sessions, the Convention will be featured by the Annual Banquet of the Society and by a Golf Tournament, which latter, with many attractive prizes offered, bids fair to become an annual fixture at the chemists' meetings. The Society looks forward to a record-breaking attendance. Various committee reports and scientific papers to be presented are published in this issue of *Oil & Fat Industries* and the remaining papers and reports will be published in full in forthcoming numbers. The Program in full is as follows:

Twenty-first Annual Meeting

of

THE AMERICAN OIL CHEMISTS' SOCIETY

HOTEL ROOSEVELT

New Orleans, May 8 and 9, 1930

President

W. R. Stryker.....New Orleans, La.

Vice-Presidents

W. H. Irwin.....Chicago, Ill.
C. W. Rice.....Columbia, South Carolina
A. S. Richardson.....Cincinnati, Ohio
A. K. Church (also *Chairman* Soap Section) Boston, Mass.

Secretary-Treasurer

J. C. P. Helm.....New Orleans, La.

Secretary Soap-Section

W. A. Peterson.....Brooklyn, N. Y.

Official Journals:

OIL AND FAT INDUSTRIES
Alan Porter Lee, Editor, New York
Soap (for soap section), New York

Governing Committee

W. R. Stryker, *Chairman*, J. J. Vollertsen, W. H. Irwin, R. H. Fash, A. S. Richardson, H. P. Trevithick, C. W. Rice, A. W. Putland, A. K. Church.

Referee Board

W. H. Irwin, Chairman, Felix Paquin, Herman Aspegren, L. C. Haskell, W. R. Stryker.

PROGRAM

THURSDAY, MAY 8, 1930

Convention called to order at 9.30 A. M.
E. G. Williams
Chairman Local Arrangements Committee

Invocation
Rev. J. S. Land, D.D.
Pastor St. Charles Ave. Presbyterian Church

Opening of Twenty-first Annual Meeting

Reading of Minutes of Last Annual Meeting
J. C. P. Helm, *Secretary*

Address of President
W. R. Stryker

Report of Secretary-Treasurer
J. C. P. Helm

Report of Governing Committee
J. C. P. Helm, Secretary

Report of Membership Committee
W. H. Irwin, *Chairman*

Report of Sampling Committee
C. V. Serbell

Chemical Resources of Louisiana
Prof. C. S. Williamson, Jr.
Tulane University of New Orleans

Report of Committee on Determination of Quantity of Lint on Cotton Seed
R. H. Fash

A Preliminary Report on the study of Methods for Cottonseed Analysis
Dr. G. S. Jamieson
(This report is from the U. S. Department of Agriculture's Committee on Methods of Sampling and Analyzing Cottonseed for Crushing)

The use of the Kaufman Thiocyanogen Value in Fat Analysis
A. D. Barber, Ph.D.
Ontario Research Foundation

Report of Color Committee
W. D. Hutchins, *Chairman*

Report of Refining Committee
C. B. Cluff, *Chairman*

Rubber Seed Oil
Dr. G. S. Jamieson

At this period there will be a general discussion on Methods with the Chemists' Committee of the National Cottonseed Products Association
T. C. Law, *Chairman*

Appointment of Special Committees

Announcements

FRIDAY, MAY 9, 1930

Report of Soap Section
A. K. Church, *Chairman*

Solvent Extraction
The New and Better Way
David Wesson

Continuous Hydrogenation
E. L. Lush
Read by Alan Porter Lee

Report of Kreis Test Committee
A. S. Richardson, *Chairman*

Report of Fat Analysis Committee
Dr. W. D. Richardson, *Chairman*

Report of Moisture Committee
W. H. Irwin

Nutrition Studies of Cottonseed Meal
Henry Stevens
U. S. Department of Agriculture, Bureau of Chemistry and Soils, Washington

Referee Board Report
W. H. Irwin, *Chairman*

Report of Olive Oil Committee
Dr. Louis M. Roeg, *Chairman*

Report of Detergents Committee
J. G. Vail, *Chairman*

Report of Smalley Foundation
H. C. Moore, *Chairman*

Report of Committee on Publication of Methods
W. H. Irwin

Rapid Method for Determination Fat Content Cottonseed Meal and Meats
Robert Schwarz

Report of Planning and Uniform Methods Committee
J. J. Vollertsen, *Chairman*

Reports of Special Convention Committees

Miscellaneous Business

Report of Nominating Committee

Election of Officers

Adjournment

E. R. Barrow, 1929 Winner, with the Nuchar Challenge Cup

A Defi and Challenges

EVERY Editorial Sanctum is disturbed periodically by rumblings and alarums. On a recent Tuesday, a Young Lochinvar out of the West rode into our particular niche on a Prairie Mustang with little prairie flowers artistically twined in his mane and back of his ears (the mustang's). Throwing Rozinante's reins over our pet paste-pot and pica-rule, Lochinvar drew his trusted mashies-niblick and assuming posture 1, according to Jock Hutchinson, addressed us (not the ball) in these stirring roundels: "I may be Royal Potentate of the Wild Prairie Flower Society, but whatever Son of a Scotchman thinks he is a-going to quaff *his* mountain dew out of that there Challenge Cup during these coming twelvemonth has got to show Pa that he can better par." We agreed. We always agree with mustang-forkers, particularly when the horse is in our sanctum.

J. Wrench, Donor, Challenge Cup

Imagine, then, our mild Editorial astonishment when on the Thursday preceding that same Tuesday, we received six black-hand letters, four fire alarms and two riot calls, each instigated by some presumptuous chemical vagabond who claims to know all about golf and cups besides.

Activated Carbons

Use of These Modern Decolorizing Agents Seen as an Aid to Stability of Edible Oils

By JOHN P. HARRIS and E. A. SIGWORTH

EVERY year the edible oil refiner becomes increasingly interested in the stability of his oil. To meet the demands of the baker and of other quality trade, he must produce a decolorized refined oil free from trace of soap or colloidal impurities; he must deodorize at such temperatures as will assure quick elimination of the fatty bodies which contain the objectionable flavors and odors, and throughout all of his processing he must guard carefully against inclusion of oxygen.

Looking back two or three decades, we find that the processing of shortening was agreeably simple for the refiner. He neutralized his oil with sodium hydroxide solution, settled out most of the soap stock from the oil which he decanted from the foots in his neutralizing kettle; added fullers' earth at high temperatures, under almost any old kind of agitation, filtered, blew with steam, mixed his deodorized oil with 15 to 20% of nearly water white oleo stearine and ran the mixture over the lard roll into packages. A nice uniform shortening. Mighty little to worry about. No one around to bedevil him about thousandths of a percent of free fatty acids and about inclusion of oxygen and elimination of a trace of soap in the oil, (maybe that trace of soap was a subject for self-congratulation, being referred to as a "sweet nutty flavor"). "Them" were the happy days of oil refining.

Even the matter of plant yields was a snap. Gross weight packages insured a shipping return well above 100%. Oil was cheap and no one bothered much about converting into net figures. But alas! alack! Today the years have brought us hydrogenation, both partial and complete (with a lot of intermediates). The consumer has been educated to demand low hundredths of a percent in free fatty acids, complete absence of soap and colloidal impurities and exclusion of oxygen, to say nothing of net weight packages.

Pity the poor oil refiner; his path is beset with pitfalls. From the time he decants his refined oil from the neutralizing kettle, there is an enemy lurking in every tank, pump and agitator to destroy him. The amazing ability of free fatty acids to multiply in every division of processing has even the family habits of the guinea pig beaten to a whisper. The affinity of his oil for the oxygen of the air is astounding and increases rapidly as the temperature rises. Even our old friend, fullers' earth, which has helped us whiten for generations, assumes a Machiavellian role when it promotes the inclusion of oxygen while being mixed with oil in the decolorizing kettle. It appears that the decolorizing effect of fullers' earth is directly due to adsorption of color, without any consideration of oxidation, (as proven by the fact that very good decolorizing action takes place when air is excluded), but it appears that, in ordinary decolorizing operations where edible fats are agitated mechanically in the presence of air at temperatures above 160°F., the fullers' earth does actually act in a measure as a catalyst for consequent inclusion of air, such inclusion resulting in reduced stability.

Vacuum bleaching, (when absolutely airtight vessels are used), tends to minimize this, undoubtedly as is the case when completely tight vacuum deodorizing vessels are used. Reduction of temperature also minimizes oxidation, but most fullers' earth declines rapidly in decolorizing ability as the temperature is reduced. The writers believe that the adverse color as well as flavor effect of oxidation, while decolorizing, often defeats the very purpose for which the refiner is striving. Fortunately activated carbons, especially those of highly adsorptive structure and particularly those whose high activity is not induced by treatment with chemicals, decolorize at very low temperatures and, even at higher temperatures, appear to exert a minimum degree of catalytic influence leading to the inclusion of oxygen; in fact some of the best carbons exert a strong reducing effect, which may result in defeating oxidation and may possibly reduce the percentage of oxygen included by volume. Therefore, they may be very profitably employed in decolorizing.

Recent tests also show that such carbons possess a very strong ability to adsorb and

(*Turn to Page* 195)

New Catalytic Hydrogenation

A Continuous Process for the Hydrogenation of Oils, Employing Unique Catalyst Preparation and Activation

By E. J. LUSH*

IN A previous article an attempt was made to review the oil hydrogenation industry by considering the numerous patents taken out to improve each step in the process.

The disadvantages inseparable from the use of a powder catalyst may be summarized as follows:—

(1) The preparation of powder catalyst is costly with respect to both the labor involved and the plant required.

(2) Just as the catalyst is warming to its work, the process must be stopped, because the particular charge of oil has been sufficiently hydrogenated.

(3) The kieselguhr or other inert support mixed with the powder catalyst adsorbs water which hydrolyses the oil. The products of hydrolysis poison the catalyst, and necessitate subsequent "soda refining" of the hydrogenated oil if it is required for edible purposes.

(4) Oils, especially semi-drying oils, such as cottonseed, deteriorate in color and flavor by prolonged heating. In a discontinuous process the oil must be heated from one to two hours.

(5) Filtration of the hydrogenated oil from the suspended catalyst in most cases involves removing the catalyst from the hydrogenation vessels.

(6) Heat interchangers which are indispensable for economical production lose efficiency in discontinuous processes.

(7) The recovery of spent catalyst involves several processes, and is costly in plant and labor. Only comparatively large factories can employ labor economically in catalyst recovery, and this gives an advantage to the large manufacturer.

It is apparent therefore that the ideal process of hydrogenation would be continuous, would avoid the use of inert supports, and yet use a rigid catalyst, which would remain in the hydrogenation vessel, and would obviate filtration. A rigid catalyst involves the necessity of opening up the plant for its removal, and if this disadvantage is to be minimized, the catalyst must have very high activity to ensure a long life, and its removal from and return to the hydrogenation vessel must be made quick and easy. Moreover, the reactivation of spent catalyst must be cheap and simple, and the method used must lead to complete recovery of activity whatever the nature of the poison including accidental poisons not common to the process. The process of the Technical Research Works, Limited, lays claim to have approached this ideal.

To avoid the use of inert supports, efforts were concentrated on making nickel its own support by the use of a compact form of nickel. A description of the early work in this direction has been published by Bolton[1] and the writer.[2] A more recent account of large-scale development of this process has been given by Bellwood.[3]

The Catalyst

THE catalyst consists of pure nickel in the form of turnings or wire, the surface of which is first oxidized and then reduced back to nickel by hydrogen. This form of catalyst avoids the use of an inert support. Further, the catalyst is spread over nickel, and not over an inner core of unreduced oxide, such as is formed by the reduction of nickel oxide in powder form. Under these conditions, reduction is thorough, and it can be carried out at low temperatures. Palmer[4] has shown, in a study of the reduction of copper oxide by hydrogen at low temperatures, that reduction takes place at the interface between copper oxide and copper. It is probably for this reason that the surface film of nickel oxide is reduced to nickel by hydrogen at 180°C., or even lower. As Sabatier[5] has pointed out, the surface oxidation of a catalyst is readily removed by hydrogen at 180°C., although higher temperatures are necessary for the reduction of nickel oxide.

* Reprinted from *The Industrial Chemist.*

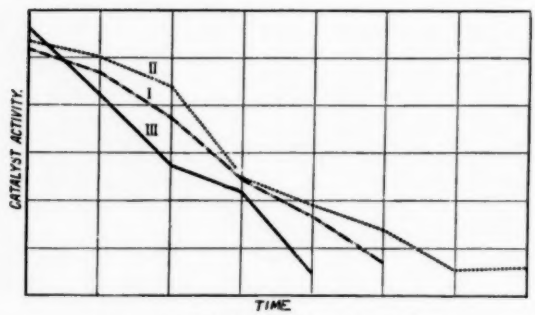


Fig. 1.—Fall in activity of catalyst during hydrogenation.

Probably the reduction at the interface between metal and oxide is bought about by the nascent or atomic hydrogen formed on the surface of the metal from molecular hydrogen.

Oxidizing the Catalyst

REFERENCE was made in the previous article to the advantage of producing nickel oxide at low temperatures. For this reason, air oxidation, which requires high temperatures, does not lead to the production of an active catalyst. The method used by Technical Research Works, Limited, is that of anodic oxidation.[6]

If a nickel surface is made the anode in an electrolytic bath, using as electrolyte a solution of a salt such as sodium carbonate, which will not allow nickel to pass into solution, a film of nickel peroxide is formed over the surface. Such a thin film is easily reduced, and the resulting catalyst is extraordinary active. The method has the merits of simplicity and cheapness without sacrificing the important factor of control, since by means of an ammeter and a voltmeter, the conditions of oxidation can be readily standardized, and the production of a catalyst of uniform activity can be depended upon.

Recovering Spent Catalyst

WHILE anodic oxidation is the method employed to oxidize the nickel turnings to produce a catalyst in the first instance, it also serves another and more important purpose. When the catalyst has been poisoned it is only necessary to extract the oil, and anodic oxidation will remove the poisons so that on reduction a catalyst is formed having its original activity fully restored.

Fig. 1 shows graphically (curve I) the fall in activity of a catalyst used in the hydrogenation of whale oil, and the same catalyst restored (curves II and III) to its original activity by anodic oxidation. In one factory, the same catalyst has been in constant use for four years without loss in either weight or activity, involving nearly a hundred reactivations of anodic oxidation.

Anodic oxidation being the method employed for activating nickel and reactivating spent catalyst, the turnings or wire must be used in a form suitable for treatment in an electrolytic bath. The turnings are therefore packed into cylinders of metal gauze with a centre rod of nickel which supports two circular flanges at its extremities. The metal gauze is fastened to the top and bottom flanges. Such a cylinder is called a *cage*.

The cages are slipped into asbestos covers, and placed upright centrally in nickel or nickel-plated vessels giving a 2-in. clearance between the cage and nickel vessel. The vessel is filled with a solution of sodium carbonate and a current passed through the electrolytic cell, the cage being made the anode and the vessel the cathode. Earthenware pots may be used with nickel sheet cathodes fitted inside.

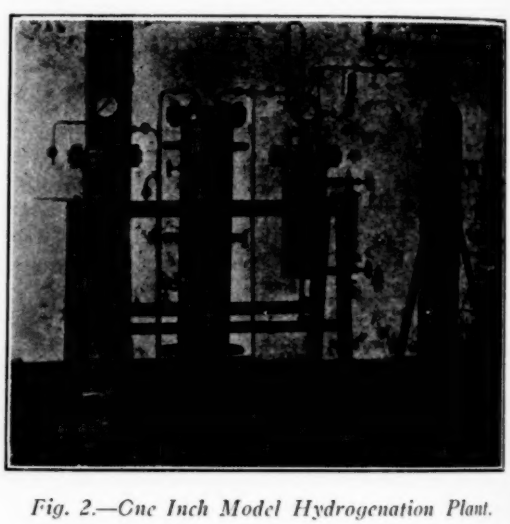


Fig. 2.—One Inch Model Hydrogenation Plant.

The strength of the current will vary with the size of the cage. For example, a cage 12 in. diam. and 3 ft. long, holding 100 lb. of nickel turnings, will require a current of 180 amperes and 7 volts for 8 hours in an electrolyte consisting of a 5 pen cent. solution of sodium carbonate.

After anodic oxidation, the cages are washed in water, which is frequently changed. The water may be changed automatically by syphon action. In this process as in the old powder process, the importance of washing thoroughly cannot be exaggerated.

The Hydrogenation Plant

THE smallest plant in which the catalyst can conveniently be packed into cages, consists of four tubes 3 in. long, containing cages 1 in. diam. Such a model has been supplied to the Battersea Polytechnic, and is shown in Fig. 2 by kind permission of the Principal, Dr. Pickard. Compressed hydrogen from a cylinder supplies hydrogen to the plant and also forces oil from the feed vessel through a drip feed in a sight glass on to the catalyst in the first tube.

The oil flows down the catalyst by gravity and is brought to the top of the next tube by the flow of hydrogen. After passing down the four tubes the oil is collected in the receiver from which it can be drawn off quite free from suspended nickel. Each cage holds 1 lb. of nickel turnings, and the plant will deliver from 10 to 15 lbs. of oil per hour, of, for example, cotton-seed oil hydrogenated to an iodine value of 50. Much information has been gained from the working of such a model, ([7])([8]).

It has been found that above a certain minimum rate of flow of oil—in this model 5 lb. per hour—the hydrogen absorbed per hour is independent of the flow of the oil, or, in other words, the degree of hydrogenation of the oil as measured by the drop in iodine value is proportional to the speed of the oil passing through the plant.

As coconut oil can be hydrogenated to an iodine value of 0.1 per cent. by a single passage through the plant, it has been calculated that all the oil comes into molecular contact with the catalyst. It is interesting in this connection to note that the hydrogen absorption per hour remains the same whether the final iodine value of cottonseed oil is 70, in which case mostly linolic acid has been hydrogenated, or

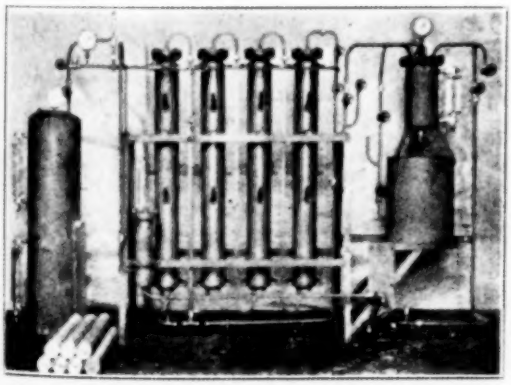


Fig. 3.—Four-Inch Model Hydrogenation Plant. Capacity: 5 tons per week.

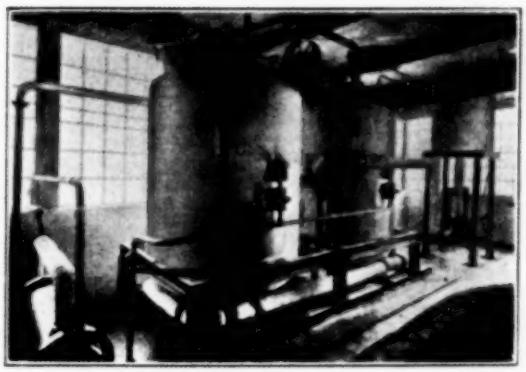


Fig. 4—Preheaters for Vacuum Drying of Oil in Hydrogenating Plant for Cottonseed Oil, &c. View shows Top Floor.

whether the iodine value is 40, when an equal proportion of linolic and oleic acid has been hydrogenated. This is taken as evidence that the limiting factor in the rate of hydrogenation is the activation of the hydrogen by the nickel.

The effect of the pressure of the hydrogen on the rate of hydrogenation is interesting. It has been found that the hydrogen absorption is proportional to the square root of the pressure, from which the writer believes the nickel atomizes the hydrogen which is then added as such directly to the double bond of the unsaturated oil. Table I confirms the results previously published[3], but with a pressure variation of 100 lb. instead of 10 lb. These results are useful in adjusting the working conditions of a large plant. If the flow of oil is too slow the catalyst is not all covered, and the hydrogen absorbed per hour will increase with increased flow of the oil. If, on the other hand, the flow of oil is too fast, in order to reach the nickel the hydrogen must pass through a thick film of oil, and this will determine the amount reaching the catalyst in a given time. Since the solubility of hydrogen in oil is proportional to the pressure, when the flow of oil is too fast, the rate of hydrogenation will be proportional to the hydrogen pressure and not its square root. These considerations enable a plant to be designed with the correct ration of length to diameter of the catalyst cages. They further allow the chemist in charge of the plant to check from time to time the efficiency with which it is working.

The 4-in. Model

A LARGER model plant is shown in Fig. 3, the cages of which are 4 in. diam. and 2 ft. 6 in. long, and there are two cages per

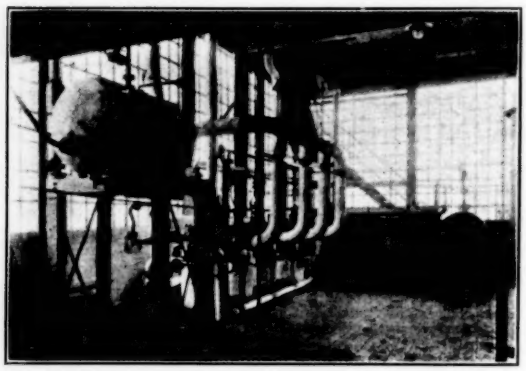


Fig. 5.—Middle Floor of Hydrogenating Plant.

tube. This plant has a capacity of 5 tons per week of cottonseed oil, hydrogenated to an iodine value of 50. Each cage holds 12 lb. of nickel turnings, from which it can be calculated that the turnings occupy 10 per cent. of the total space in the cage.

As nickel is ten times heavier than oil, the weight of oil in lbs. equivalent to the cubic capacity of the cage is equal to the weight of turnings used to fill it. For estimating the output from a plant of given size one can therefore use the cubic capacity of the plant expressed in lbs. of oil or the weight of turnings. Experience has shown that a plant will deliver cottonseed oil hydrogenated to an iodine value of 50 at an average hourly rate expressed in lbs. per hour equal to its own cubic capacity or the weight of the catalyst contained in it. For example, the plant shown in Fig. 3 requires 100 lbs. of oil to fill it; the weight of nickel turnings contained in the eight cages is also 100 lbs., and it will deliver 100 lbs. per hour of cottonseed oil (average iodine value of 50).

TABLE I.

Effect of Hydrogen Pressure on the Rate of Hydrogenation

P Hydrogen Pressure lb. per sq. in.	Iodine Values Original Oil 105.2 Final Product	Difference	Time in Minutes	C.C. of Oil	Hydrogen absorbed P	Hydrogen absorbed √P
0	95.6	10.6	5	200	708	272
100	66.2	40.0	5	200	347	372
200	51.1	55.1	5	200	256	377
300	40.8	65.4	5	200	207	370
200	48.2	58.0	5	200	270	396
100	60.3	45.9	5	200	398	425
0	91.2	15.0	5	200	1000	384

12-in. Factory Model

FOR the hydrogenation of oils in the factory, standard cages each 12 in. diameter and 3 ft. long have been found most convenient. Each tube contains three cages. The first plant was erected in 1922 at the works of Loders & Nucoline Limited, Silvertown, London, E.

In this plant the oil is circulated *in parallel* through five tubes, while the sixth is being reactivated. By stopping a tube for reactivation every second day, a uniform output of hydrogenated oil can be maintained continuously with a variation in iodine value not exceeding 1 per cent. The oil from the five tubes flows by gravity down the catalyst in the cages, and collects in a receiver situated below the tubes. It is taken by an oil pump from the receiver and pumped into the tops of the tubes by a suitable manifold connection. The continuous flow of oil is maintained by adjusting on outlet valve from the receiver to deliver the same volume of hydrogenated oil as is supplied to the manifold by a pump connected to the storage tanks of untreated oil.

A strictly continuous process, such as is used in the 4-in. model plant, is preferable for the hydrogenation of cottonseed, soya bean, whale oil, and other oils having high iodine values.

By the courtesy of Mr. Pearson, Chairman of the British Oil & Cake Mills Limited, the following photographs of a plant operating in this latter way are reproduced. The plant is arranged on three floors. On the top floor, Fig. 4, the two preheaters can be seen arranged for vacuum drying of the oil to be hydrogenated. These have now been substituted by a continuous tubular preheater, and are used as storage tanks.

On the middle floor, Fig. 5, the four tubes are shown with the various connections for supplying the plant with oil and hydrogen. The solvents store tank for use in connection with the extraction *in situ* of spent cages is shown, as also the three earthenware activating vessels and high pressure hydrogen storage vessel.

Fig. 6 shows the bottom of the four tubes, the solvent recovery still, and the hydrogenated oil receiver. The oil is carried from the bottom

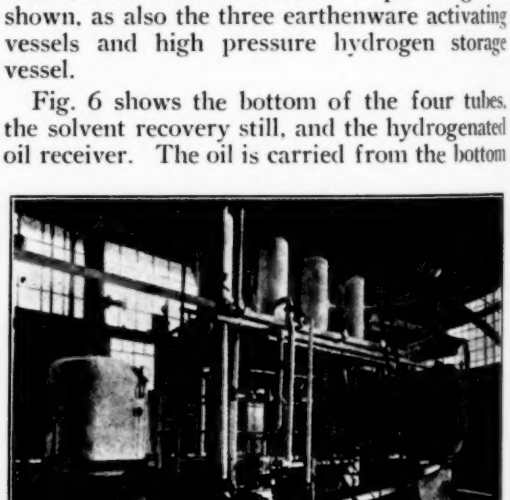


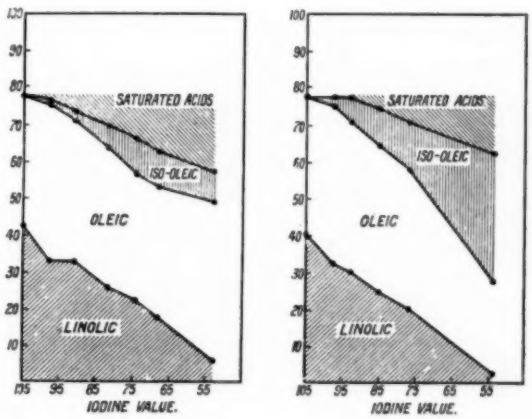
Fig. 6.—Lower Floor, showing Bottom of Tubes, Recovery Still, &c.

of one tube to the top of the next by means of the hydrogen, which is circulated round the tubes. This procedure avoids the use of oil pumps between the vessels, and incidentally by watching the pressure gauges on the tubes one can see at a glance whether there is a free passage throughout the system. The time taken from the moment the oil enters the preheater or heat interchanger until it reaches the hydrogenated oil receiver is about 10 minutes. From here it is forced by the hydrogen pressure in the system—60 lb. per square inch —through the heat interchanger to preheat the incoming oil.

The fact that the catalyst is free from unreduced nickel oxide or kieselguhr explains why the free fatty acids are not increased by this process. The average free fatty acids of cottonseed oil with an iodine value of 50-55 made in this plant is 0.08 per cent. In the powder process they frequently rise to 0.5 per cent., or even 1 per cent., with inferior oils where fresh catalyst has to be added to complete hydrogenation. In this plant oil is hydrogenated continuously for three weeks, and the plant is then shut down for two days for reactivation of catalyst. After cooling down, the cages are extracted *in situ*, the solvent removed, and the cages taken out and reactivated by anodic oxidation for eight hours in the electrolytic bath. They are then washed, returned to the plant and reduced in hydrogen at 180° C and hydrogenation recommenced.

The length of time a set of cages will remain active depends upon the nature of the oil and the care taken in refining it, particularly in the removal of soap. In the laboratory common edible cottonseed oil can be hydrogenated continuously for a month by the use of an electrically heated tube provided with a sufficiently large store tank placed above it for supplying the oil by gravity. The apparatus can be left unattended even over the week-ends. Care must be taken by electrically heating the hard oil receiver to prevent the formation of stalagmites of hydrogenated oil which will otherwise rise even over a foot in height and choke the tube.

It is interesting to note the capacity of the activating baths for supplying cages. A set of three earthenware vessels to take the three cages used in each tube will reactivate the cages in eight hours, and since the cages remain active in use from 200 to 400 hours, three vessels will supply cages for 25 to 50 tubes where their cages are reactivated in rotation.



The Hydrogenated Oil

REFERENCE has already been made in a previous article to the importance of encouraging selective hydrogenation and repressing the formation of iso-oleic acid. The writer considers the effect of the hydrogen pressure on the rate of hydrogenation, is evidence of the direct addition of single atoms of hydrogen to the double bond of the unsaturated oil (see Table I). On this view iso-oleic acid is formed by the single atom being ejected before another atom arrives to stabilize the semi-saturated double bond. If this be so then conditions which facilitate the arrival of more atoms, should decrease iso-oleic acid formation. Experimental evidence proves that the continuous hydrogenation process described above keeps the catalyst working at its maximum efficiency in supplying atoms of hydrogen Therefore this process should produce the minimum amount of iso-oleic acid at any given temperature. That this is true experimentally has already been published, and Fig. 7 is reproduced as suport to the theory and evidence of the importance of the process to the oil hydrogenation industry.

[1] *J.S.C.I.*, **41**, 384 R, 1922.
[2] *J.S.C.I.*, **42**, 219 T, 1923.
[3] *Chem. Trade Jour.*, Mar. 6, 1925.
[4] *Proc. Roy. Soc.*, A. 103, 1923.
[5] *Journ. Ind. and Eng. Chem.*, Oct., 1926.
[6] U.K. Pat. 203,218.
[7] *J.S.C.I.*, **43**, 53 T.
[8] *J.S.C.I.*, **44**, 129 T.

Grape Fruit Seed Oil

Contribution from The Oil, Fat and Wax Laboratory, Bureau of Chemistry and Soils, United States Department of Agriculture

By G. S. JAMIESON, W. F. BAUGHMAN and S. I. GERTLER

IN RECENT years the commercial canning of grape fruit has become of some importance, both in Florida and Porto Rico, and it is desirable that use be made of the quantities of seed which accumulate at the canneries. As the air dried seed usually contain thirty per cent or more of oil, the possibility of the utilization of the seed for the oil has attracted attention, but no information was available as to the character of the oil, or the purposes for which it might be used if prepared on a commercial scale. Some time ago Ralph Polk of the Polk Company, Haines City, Florida, had a quantity of the seed pressed by an Anderson oil expeller and we obtained a gallon sample of the oil for examination. When the investigation was nearly completed, we were informed by J. L. Hutton of the Oil Processes, Incorporated, Harrison, New Jersey, that they had made some experiments on the solvent extraction of the oil from Florida cannery seed and as we were interested in comparing this oil with the expressed product, a sample together with some of the extracted seed was sent to us.

Grape fruit seed and the oil, like those from other citrus fruit, have a bitter taste, and apparently no one has yet devised a feasible method for the removal of this taste from the oils, consequently, it would appear that the only market for this oil would be found among the soap manufacturers. R. S. McKinney, of this laboratory, has shown recently that a medium-hard, light-colored soap can readily be prepared by saponifying the oil with caustic soda. After the cakes had air-dried for five days, the soap was found to lather very readily.

From the analyses given below, it will be observed that the press cake and extracted meal have considerable value as feed, or as fertilizing material. Owing to the very bitter taste, however, cattle in this country will not eat the cake and meal, although the seed are said to be eaten by animals in the vicinity of the cannery in Porto Rico. In order to utilize them for feeding, the bitter taste must be considerably reduced by mixing the products with other suitable materials.

Characteristics of the Oil

THE chemical and physical characteristics are given in Table I for both the expressed and solvent extracted oils. The percentages of saturated and unsaturated acids were determined by the lead-salt ether method (J. Assoc. Offic. Agri. Chemists 1928, 11, 303), and corrections were made for the small quantity of unsaturated acids that is precipitated and weighed with the saturated acid fraction. The percentage of unsaturated acids has also been corrected for the unsaponifiable matter that remains with the unsaturated fraction. From the iodine number, it will be observed that the oil belongs to the semi-drying class, particularly so in view of the large quantity of linolic acid present as glyceride in the oil.

A sample of the oil extracted by the Oil Processes, Incorporated, was examined by H. P. Trevithick, Bureau of Chemistry of the New York Produce Exchange, with the following results: Specific gravity at 15.5°—0.9207; iodine number (Wijs)—103.3; saponification value—194.8; unsaponifiable matter—0.5; acid value—4.0, titer—36.1°; and refining loss (using 7.1 per cent of 16° Baumé caustic soda), 7.1 percent. The refined oil had a color of 90 yellow, 3 red, and 2 blue (Lovibond glasses).

For comparison, the color of the crude oils (depth of column 5.25 inches) was measured, with the following results: Expressed oil 35 y and 6.6 r, extracted oil 35 y and 6.9 r. The expressed oil was a clear, bright yellow, whereas the extracted oil was yellow with a greenish tint and when viewed by reflected light in a bottle, had a strong purple fluorescence.

Unsaturated Acids

FROM the iodine number of the oil and the percentage of unsaturated acids, the iodine number of the latter was calculated to be 155.2. This value was used in the calculation of the oleic and linolic acids present in the oil, with the following results:

Unsaturated Acids		In Oil	As Glycerides
	%	%	%
Oleic acid	28.70	19.66	20.5
Linolic "	71.30	48.84	51.0

TABLE I

Chemical and Physical Characteristics.

	Expressed Oil	Extracted Oil
Specific gravity 25/25°	0.9170	—
Refractive Index at 25°	1.4700	1.4596
Acid value	2.5	3.3
Iodine number (Hanus)	106.3	109.4
Saponification value	194.1	194.3
Acetyl value	7.7	—
Unsaponifiable matter %	0.7	0.7
Saturated acids (corrected) %	26.60	27.63
Unsaturated acids (corrected) %	68.50	67.77
Iodine number of unsaturated acids	146.2	—

Saturated Acids

THE saturated acids which were separated from the oil by the lead-salt ether procedure were esterified with absolute methyl alcohol, dry hydrogen chloride gas being used (*Jour. Amer. Chem. Soc.* 1920, 42, 1200), and the resulting esters were fractionally distilled under diminished pressure. The data for the distillations are given in Table II. The preliminary distillation was made from a 500 cc. Claissen flask, giving five fractions and a residue, which were refractionated in the order indicated in the table from a 150 cc. Ladenburg fractionation flask.

TABLE II

103.2 grams of esters taken for distillation.

	Fraction	Temperature °C	Weight Grams
Preliminary distillation under 2 mm. pressure—			
	A	160-5	14.80
	B	166-8	22.30
	C	169-70	27.65
	D	180-190	22.00
	E	191-200	19.20
	Residue		2.15
Final distillation under 2 mm. pressure—			
A + B added	1	160-5	10.30
C added	2	166-70	22.00
	3	172-4	21.95
D + E added	4	175-8	23.30
Res. added	5	180-8	17.20
	6	190-200	12.10
	Residue		1.29

TABLE III

Results of Analyses of Fractions From Distillation of Methyl Esters.

Fractions	Iodine Nos.	Sapon. Values	Esters Unsat. acids %	Mean Mol. Wt. of Esters of Sat. Acids	Palmitic Acid Grams	Stearic Acid Grams	Lignoceric acid Grams
1...	1.28	206.3	1.58	271.6	9.182	0.448	—
2...	1.65	204.3	1.20	274.5	17.462	3.081	—
3...	1.84	203.9	1.77	274.8	17.096	3.353	—
4...	2.61	203.7	2.46	275.0	16.746	4.824	—
5...	4.48	200.5	4.35	279.2	10.514	5.144	—
6...	9.63	189.6	8.52	295.9	0.486	9.985	—
Residue						0.150	0.600
Total					71.486	26.995	0.600

The iodine numbers and the saponification values of these six fractions were determined, and are recorded in Table III. The small final residue was saponified with alcoholic potash, and the fatty acids were liberated with hydrochloric acid, collected, dried and subjected to fractional crystallization from alcohol. Finally, 0.150 grams of stearic acid melting at 68-69°, and 0.600 grams of lignoceric acid melting at 80° were obtained. In addition to these acids, the residue as usual contained some decomposition products and unsaturated esters.

The mean molecular weights given in the table indicate what acids may be present in each fraction. In order to prove that these indications are correct, the free fatty acids were recovered from portions of several of the ester fractions in the usual manner after saponification with alcohol potash, and submitted to fractional crystallization from alcohol. Their identity was established by the melting points and by observing whether or not they were lowered when the substances were mixed with equal quantities of the respective acids, the purity of which had been established by analysis

The deductions drawn from the molecular weights of the saturated acids were confirmed as follows: Fractional crystallization of the acids from fraction 1, in which 10 crops of crystals were obtained, gave no evidence of the presence of myristic acid, which fact was confirmed by the mean molecular weight of the saturated acids. Palmitic acid, $C_{16}H_{32}O_2$, melting at 63° was isolated in quantity from fractions 1, 2, 4 and 5; stearic acid, $C_{18}H_{36}O_2$, melting at 68-9° was separated from fractions 2, 5 and 6; lignoceric acid, $C_{24}H_{48}O_2$, melting at 80° was found only in the residue.

The quantities of saturated acids in the fractions were calculated from the mean molecular weight of their esters and the theoretical molecular weight of the two esters in each fraction, the results of which are given in Table III.

In Table IV the percentage composition of the saturated acids is given in column 2. These values calculated to the basis of the original oil are given in column 3. In column 4, are the equivalent percentages of the glycerides.

TABLE IV

Grape Fruit Seed Oil Saturated Acids.

Acids	Grams	Percent	Acids in Oil Percent	Glycerides in Oil Percent
Palmitic	71.486	72.15	19.19	20.1
Stearic	26.995	27.25	7.25	7.6
Lignoceric	.600	0.60	0.16	.1
			26.60	27.8

A sample of the extracted grape fruit seed was examined by G. L. Bidwell and M. R. Coe, Cattle Food Unit, Food, Drug and Insecticide Administration, with the following results:

	Percent
Moisture	9.7
Ash	3.8
Ether Extract	4.3
Protein	21.4
Crude fiber	22.0
Nitrogen Free Extract	38.8

Summary

THE characteristics of both the expressed and extracted grapefruit seed oils have been determined. The samples of this semi-drying oil (iodine numbers 100-106) contained from 26.6 to 27.6 percent of saturated acids. Upon saponification with caustic soda, the oil gave a medium-hard soap, which after air-drying for five days was found to lather freely.

The extracted seed were found to contain 21.4 percent of protein, 38.8 percent of nitrogen free extract, and 22 percent of crude fiber, a composition which indicates considerable feeding value, but owing to the bitter taste it would be necessary to add other feeding materials that would render the mixture palatable to stock.

The composition of the expressed oil has been determined with the following results:

Glycerides of	Percent
Oleic acid	20.5
Linolic acid	51.0
Palmitic acid	20.1
Stearic acid	7.6
Lignoceric acid	0.1
Unsaponifiable acid	0.7

South African Whaling

THERE are two companies in Durban, Union of South Africa, engaged in whaling—The Union Whaling Co., Ltd., and The Premier Whaling Co., Ltd. Together they employ about 510 seamen and 15 whalers. The total number of whales taken during the 1928 and 1929 seasons were respectively 1,194 and 1,797. Of the sperm species 541 were taken in 1928 and 841 in 1929. There were of fin whales taken, 429 and 637 respectively for the two seasons. Other varieties included small numbers of hump, blue and sei whales.

Production of Whale Products.

	Long tons	Value
1928		
Whale oil	8,552	$992,570
Fertilizer	4,454	161,396
TOTAL VALUE		$1,153,966
1929		
Whale oil	12,111	$1,275,733
Fertilizer	6,468	246,045
TOTAL VALUE		$1,521,778

In 1928, the sperm oil production of Durban was exported to Europe, and about one-half of the whale fertilizer was shipped to the United States. In 1929 nearly all the sperm oil, and about one-half of the whale oil and guano was exported, all the oil being shipped to Europe. The whale oil is produced in two grades; sperm oil, and whale or train oil obtained from the other species of whales. The entire output of sperm oil and whale oil from Durban is usually disposed of in the United Kingdom and Europe at very fair prices.

During 1929, prices dropped considerably, and towards the end of the year, £16 ($77.86) per long ton, F.O.B. Durban, in drums of 90 gallons, for sperm oil was quoted, with a correspondingly low quotation for whale oil.

Exports of Whale oil—1928.
Union of South Africa.

	Gallons	Value
United Kingdom	554,958	$213,283
Holland	1,647,688	841,836
France	18,147	5,347
Germany	2,310,294	1,210,994
Portuguese East Africa	1,315	987
Total	4,542,402	$2,272,447

The exports of whale oil and whale fertilizer through the Port of Durban approximate half of the total exports of the Union.

Consular Report from Durban

An extensive advertising campaign is being launched by the Marine Products Corporation of Seattle for its new salmon oil and salmon meal products, made from fish waste, heads, scales, and other discarded portions of salmon at canneries in Alaska and Seattle, for the use of livestock. Poultry, cattle and swine are given the new products from the waste, as a part of corrective and health-giving diets for livestock.

The Kansas State Grain Inspection Department is doubling the capacity of its protein laboratory at Hutchinson, Kansas. Additional new equipment manufactured by the Laboratory Construction Company of Kansas City, Missouri, is being installed and upon completion the State laboratory at Hutchinson will be the largest protein laboratory in the World. The Laboratory Construction Company has just finished manufacturing a large capacity of nitrogen apparatus and laboratory equipment tables for the Omaha Grain Exchange at Omaha, Nebraska and complete nitrogen equipment for the Sao Paulo, Brazil laboratory of the Corn Products Refining Company of Chicago.

Smalley Foundation Committee Report

Cooperative Meal Samples for the Season 1929-1930

By H. C. Moore, *Chairman*

THE following tables give a summary of the results of cooperative analytical work of the Smalley Foundation for oil and ammonia for the past year. The work was concluded with sample No. 30, reported on April 16, 1930. There were 96 collaborators participating this year, as compared with 91 and 102 for the years 1927-28 and 1928-29 respectively.

In table No. I is shown the standing of the 45 collaborators who reported oil determinations on all samples. In the two preceding years 42 and 46 respectively reported on all samples. Table No. II shows the corresponding standing of the 75 collaborators who reported ammonia results on all samples. This number compares with 63 and 74 respectively in the two preceding years. Table No. III gives the combined average standing for both oil and ammonia for the 45 collaborators who reported both oil and ammonia on all samples. In the two preceding years 42 and 46 collaborators reported oil and ammonia results on all samples. Table No. IV gives the summary of results of other collaborators who failed to report on all samples, but whose results deserve recognition. Table No. V gives an idea of the degree of uniformity of results for oil and ammonia separately on the 30 samples. The best general agreement for oil is found in the case of sample No. 29, and for ammonia on sample No. 23; the poorest agreement for oil is in the case of sample No. 23, and for ammonia on sample No. 2. This table shows the maximum, minimum and average number of collaborators in the case of oil and ammonia within the three ranges chosen for all samples.

The Awards

THE awards for the best work on the thirty samples are the same as for several seasons past, and as published in the Cotton Oil Press in 1923. The prize winners are as follows:

The Battle cup for the highest efficiency in the determination of both oil and ammonia is awarded to No. 53, Southwestern Laboratories, Dallas, Texas, whose average is 99.956½ percent. The certificate for second place goes to No. 20, Dr. W. F. Hand, State Chemist, A & M College, Mississippi, whose average efficiency is 99.926 percent. The corresponding percentages for the two previous years were 99.934 and 99.919½, 99.874 and 99.848 percent respectively. The collaborators will recall that the present cup was furnished by the late Dr. H. B. Battle, after he had been awarded permanently the original cup, having won it on three different occasions. This is the fourth award of this cup. In 1926-27 it was awarded to Dr. W. F. Hand, State Chemist, A & M College, Mississippi; in 1927-28 to Mr. E. H. Tenent, International Sugar Feed Co., Memphis, Tennessee; and in 1928-29 to Geo. W. Gooch Laboratories, Los Angeles, California.

The certificate for the highest efficiency in the determination of oil is awarded to No. 53, Southwestern Laboratories, Dallas, Texas, whose average is 99.938 percent, and the certificate for second place goes to No. 20, Dr. W. F. Hand, whose average is 99.918 percent. The corresponding percentages for the two preceding years were 99.920 and 99.895, 99.839 and 99.791 percent respectively. The certificate for the highest efficiency in the determination of ammonia is awarded to No. 47, Mr. George K. Redding, The Larrowe Milling Co., Rossford, Ohio, whose average is 99.984 percent, and the certificate for second place goes to No. 53, Southwestern Laboratories, whose average is 99.975 percent. The corresponding percentages for the two previous years were 99.979 and 99.965, 99.974 and 99.965 percent respectively. In accordance with the resolution adopted by the American Oil Chemists' Society, the identity of the other collaborators will not be disclosed. The foregoing comparisons show that the percentage efficiency for both oil and ammonia, as well as for the combined oil and ammonia work is higher than for the past two years. The method for determining the standing of the various collaborators and their percent efficiency is the same as that used for several years past, and is fully described in the January, 1923, issue of the Cotton Oil Press, Vol. VI, No. 9, Page 33. The same rule has also been used as heretofore in calculating the accepted averages. This method is described in the May, 1929, issue of Oil & Fat Industries, Page 25.

The Samples

THERE have been fewer complaints from the collaborators regarding the samples during this past year than in any previous year, and the chairman feels that the committee and all the collaborators wish to thank Mr. Law for his careful work in the preparation and handling of the samples. Mr. Law has asked to be advised if there is any doubt as to the uniformity of the samples, and the chairman has passed on to him the two or three complaints received this season. The collaborators were given the opportunity to be advised by wire collect if their reports are not received at the appointed time each week, or in case there seems to be a typographical error in their reports. Only 43 took advantage of this offer and there have been one or two misunderstandings in this respect, where collaborators thought that they had asked to be notified by wire, but the chairman had received no such request so was obliged under our rules to accept only such results as are received before the report goes to press, which includes Tuesday of each week. Results received between Tuesday noon and the time the copy is sent to the printer early Wednesday morning have been accepted, but these results are not counted in making up the accepted average. The number of results received after the average has been calculated might possibly change this average as much as .01, although this condition would rarely occur.

The chairman has received several recommendations during this past year that results for nitrogen be reported in place of ammonia. This matter was submitted to the committee, who voted as not in favor of this change, at least for another year. Nitrogen values are replacing ammonia values quite generally, particularly in fertilizer practice, and it is recommended that some thought be given to this proposed change in our method of reporting before the next series of samples begins, about September, 1930.

No reference has been made in this report to the moisture results, as these are being referred to in the report of the chairman of the Moisture Committee.

Summary

THIS year's report of the Smalley Foundation shows much progress. While not quite as many collaborators were enrolled as in the preceding year, the percent efficiency is higher and the value of this work is becoming more fully appreciated each season. The chairman wishes to again emphasize that the purpose of the cooperative work is not to provide a contest to win a prize, but to improve the quality of the analytical work of those taking part. It is hoped that future years will show continued progress. In concluding, the chairman wishes to thank the collaborators and the members of the committee for their cooperation in this important work.

Personnel of committee:

H. C. MOORE, *Chairman*
G. WORTHEN AGEE
C. A. BUTT
L. B. FORBES
N. C. HAMNER
L. C. HASKELL
G. K. WITMER

TABLE I—OIL RESULTS, ALL SAMPLES

(Average analysis, Oil 6.475)

Rank	An. No.	Points off	Av. per sample	Efficiency
1	53	12	.0040	99.938
2	20	16	.0053	99.918
3	59	22	.0073	99.887
4	86	24	.0080	99.877
5	79	32	.0107	99.835
6	2	33	.0110	99.830
7	50	39	.0130	99.799
8	58	49	.0163	99.748
9	35	52	.0173	99.733
10	80	57	.0190	99.706
11	40	60	.0200	99.691
	84	60	.0200	99.691
13	62	61	.0203	99.686
14	42	64	.0213	99.671
15	88	65	.0217	99.665
16	47	67	.0223	99.656
17	33	71	.0237	99.634
18	85	74	.0247	99.618
19	19	81	.0270	99.583
20	81	82	.0273	99.578
21	56	86	.0287	99.557
22	12	92	.0307	99.526
23	91	100	.0333	99.485
24	71	108	.0360	99.445
25	43	112	.0373	99.424
26	21	116	.0387	99.403
27	67	119	.0397	99.387
28	35	123	.0410	99.366
29	69	124	.0413	99.362
30	54	126	.0420	99.351
31	41	128	.0427	99.340
	49	128	.0427	99.340
33	39	150	.0500	99.228
34	70	155	.0517	99.200
35	64	168	.0550	99.135
36	52	174	.0580	99.105
37	66	184	.0613	99.054
38	51	199	.0663	98.975
39	55	201	.0670	98.965
40	1	205	.0683	98.944
41	34	214	.0713	98.893
42	48	249	.0830	93.718
43	61	301	.1003	98.450
44	57	313	.1043	93.389
45	13	803	.2677	95.862

TABLE II—AMMONIA RESULTS, ALL SAMPLES

(Average analysis, Ammonia 7.98)

Rank	An. No.	Points off	Av. per sample	Efficiency
1	47	4	.0013	99.984
2	53	6	.0020	99.975
3	91	8	.0027	99.966
4	55	10	.0033	99.959
5	86	11	.0037	99.954
6	3	21	.0040	99.949
7	27	13	.0043	99.946
	40	13	.0043	99.946
9	78	14	.0047	99.941
10	20	16	.0053	99.934
	36	16	.0053	99.934
12	38	20	.0067	99.916
	85	20	.0067	99.916
14	25	22	.0073	99.909
15	59	23	.0077	99.904
	71	23	.0077	99.904
17	12	26	.0087	99.891
18	88	27	.0090	99.887
19	9	28	.0093	99.884
	72	28	.0093	99.884
21	43	29	.0097	99.879
	62	29	.0097	99.879
23	4	32	.0107	99.866
	56	32	.0107	99.866
25	28	33	.0110	99.862
	48	33	.0110	99.862
27	50	34	.0113	99.859
	79	34	.0113	99.859
29	80	35	.0117	99.854
	83	35	.0117	99.854
31	39	36	.0120	99.850
32	58	37	.0123	99.846
33	52	38	.0127	99.841
34	2	39	.0130	99.837
	49	39	.0130	99.837
	54	39	.0130	99.837
	64	39	.0130	99.837
38	16	42	.0140	99.825
	24	42	.0140	99.825
40	1	43	.0143	99.821
	10	43	.0143	99.821
42	19	45	.0150	99.812
43	84	46	.0153	99.808
44	8	47	.0157	99.803
	42	47	.0157	99.803
46	76	48	.0160	99.800
47	61	54	.0180	99.775
48	23	57	.0190	99.762
	33	57	.0190	99.762
50	17	59	.0197	99.753
51	35	61	.0203	99.746
52	21	65	.0217	99.728
	34	65	.0217	99.728
	74	65	.0217	99.728
55	46	66	.0220	99.724
56	70	68	.0227	99.716
57	81	69	.0230	99.712
58	69	71	.0237	99.703
59	7	74	.0247	99.691
	95	74	.0247	99.691
61	11	77	.0257	99.678
	51	77	.0257	99.678
	57	77	.0257	99.678

TABLE II (continued)

Rank	An. No.	Points off	Av. per sample	Efficiency
64	41	80	.0267	99.666
65	29	92	.0307	99.615
66	30	95	.0317	99.602
67	5	97	.0323	99.595
68	77	111	.0370	99.536
69	15	121	.0403	99.495
70	14	131	.0437	99.453
71	96	132	.0440	99.449
72	22	136	.0453	99.432
73	66	149	.0497	99.377
74	67	179	.0597	99.252
75	13	198	.0660	99.173

Table III—Oil and Ammonia Results

All Samples

Rank	Analyst	Efficiency
1	53	99.956½
2	20	99.926
3	86	99.915½
4	59	99.895½
5	79	99.847
6	2	99.833½
	36	99.833½
8	50	99.829
9	47	99.820
10	40	99.818½
11	58	99.797
12	62	99.782½
13	80	99.780
14	88	99.776
15	85	99.767
16	84	99.749½
17	42	99.737
18	91	99.725½
19	56	99.711½
20	12	99.708½
21	33	99.698
22	19	99.697½
23	71	99.674½
24	43	99.651½
25	81	99.645
26	54	99.594
27	49	99.588½
28	21	99.565½
29	35	99.556
30	39	99.539
31	69	99.532½
32	41	99.503
33	64	99.486
34	52	99.473
35	55	99.462
36	70	99.458
37	1	99.382½
38	51	99.326½
39	67	99.319½
40	34	99.313
41	48	99.290
42	66	99.215½
43	61	99.112½
44	57	99.033½
45	13	97.517½

(*Turn to Page* 195)

A. O. C. S.

Committee Reports

Report of Referee Board 1929-30

THE Referee Board considered and granted Limited Referee Chemists' on all Products Covered by the Rules of the National Cottonseed Products Association to the following:

E. R. Barrow, Barrow-Agee Labs., Inc., Memphis, Tenn.; W. J. Bramblett, Texas Testing Labs., San Antonio, Texas; H. M. Bulbrook, Industrial Labs., Fort Worth, Texas; B. L. Caldwell, Barrow-Agee Labs., Inc., Jackson, Miss.; P. D. Cretien, Texas Testing Labs., Dallas, Texas; Curtis & Tompkins, 236 Front St., San Francisco, California; D. B. Dickson, San Antonio Labs., San Antonio, Texas; R. H. Fash, Fort Worth Labs., Fort Worth, Texas; L. B. Forbes, L. B. Forbes Labs., Little Rock Arkansas; N. C. Hamner, Southwestern Labs., Dallas, Texas; J. C. P. Helm, 705 Tchoupitoulas St., New Orleans, La.; R. G. Huffman, Geo. W. Gooch Labs., Los Angeles, Calif.; N. E. Katz, P. O. Box 243, Meridian, Mississippi; Laucks Laboratory, 314 Maritime Bldg., Seattle, Washington; T. C. Law, Law & Company, Atlanta, Georgia; S. Lomanitz, General Labs., Oklahoma City, Okla.; J. R. Mays, Jr., Barrow-Agee Labs., Inc., Shreveport, La.; D. C. Picard, 4th Ave. & 20th Sts., Birmingham, Ala.; F. B. Porter, Fort Worth Labs., Fort Worth, Texas; A. H. Preston, Southwestern Labs., San Antonio, Texas; C. W. Rice, P. O. Box 538, Columbia, S. Carolina; F. R. Robertson, Houston Labs., Houston, Texas; F. C. Schilling, Industrial Labs., Fort Worth, Texas; H. M. Shilstone, 510 Gravier St., New Orleans, La.; P. McG. Shuey, Shuey & Co., Inc., Savannah, Georgia; J. H. Sorrels, Terrell's Labs., Fort Worth, Texas; E. H. Tenent, L. B. Forbes Labs., Little Rock, Ark.; E. G. Williams, Baronne Bldg., New Orleans, Louisiana; G. K. Witmer, The Battle Laboratory, Montgomery, Alabama.

Limited Referee Certificates on Cake & Meal work only were granted to R. M. Chapman, Indiana Labs., Hammond, Indiana and to Wiley & Company, Inc., Calvert & Read Sts., Baltimore, Md.

Full Referee Certificates on All Products were granted to F. Paquin, Galveston Laboratory, Galveston, Texas and H. P. Trevithick, Bureau of Chemistry, New York Produce Exchange, New York, New York.

During the year the Referee Board sent out two check samples of Crude Oil to the Referee Laboratories. The results on the first sample sent out which was a sample of Prime Crude Oil with a free acid of about 1% showed considerable variation in both loss and color. Unfortunately the second sample of Crude Oil sent out was very abnormal in its behavior, the free acid results varying from 1.5% to 3.0% although all the samples were handled at approximately the same time in the several Referee Laboratories. The color results and refining loss results varied so widely that they were practically valueless. Tabulations covering the results obtained on these samples after eliminating the names of the Referee Laboratories were placed in the hands of the Refining Committee for their consideration.

A check sample of Yellow Oil was also sent out to the Laboratories and all Referees were asked to make the reading on the same day. While the majority of the results in this instance were in fair agreement, the range was much too wide. These results emphasize the necessity for the adoption of a standard tintometer and method of reading color. These results were referred to the Color Committee for their consideration.

The Referee Board recommends to the new Referee Board that the sending out of check samples to the Referee Laboratories be continued.

W. H. IRWIN, *Chairman*
W. R. STRYKER
H. ASPEGREN
L. C. HASKELL
F. PAQUIN

Report of Sampling Committee

THE committee has carefully studied the work done by the previous committee, also made investigation of commercial samplers (triers) now on the market and have unanimously come to the conclusion that none of the samplers (triers) now offered for sale or advertised as Official Oil Samplers, complies with the rules of the National Cottonseed Products Association. The committee has unanimously agreed that Official Oil Samplers (triers) in order to comply fully with the requirements, Rule 242, Section 2, should meet the following specifications:

1. Uniform inside diameter of 2 inches (equal to 3.14 sq. in.)

2. Should remain fully open as it passes through the oil and close only after the bottom of the tank is reached.
3. Must have a smooth inside finish so as to prevent accumulation of dirt and moisture and facilitate cleaning.
4. Must be of simple construction; be able to withstand rough handling without damage, particularly to the valve mechanism.
5. Must be light and well balanced so that the sample may be taken vertically without difficulty.
6. Must be of such construction that the human element when taking sample will be as much as possible eliminated; that is, same sample will be obtained whether the trier is inserted or withdrawn fast or slow.
7. Should be so constructed that sample can be obtained to within ¼ inch (or less) of the bottom of the tank.

On this basis the committee found that only one sampler (trier) submitted to the committee meets the requirements, sampler (trier) No. 5, described in previous committee's report. This sampler (trier) has been approved by the committee and will hereafter be referred to as "Official Oil Trier, Type 1" described as follows:

> "This trier consists essentially of a specially designed valve housing and plug (plug cock type) having 2 inch diameter unrestricted opening when fully opened. The opening and closing mechanism is so designed that the valve when inserted in tank will be fully open and after the valve reaches the bottom, same can be tightly closed. The trier when properly constructed will take sample to within ¼ inch of the bottom of the tank."

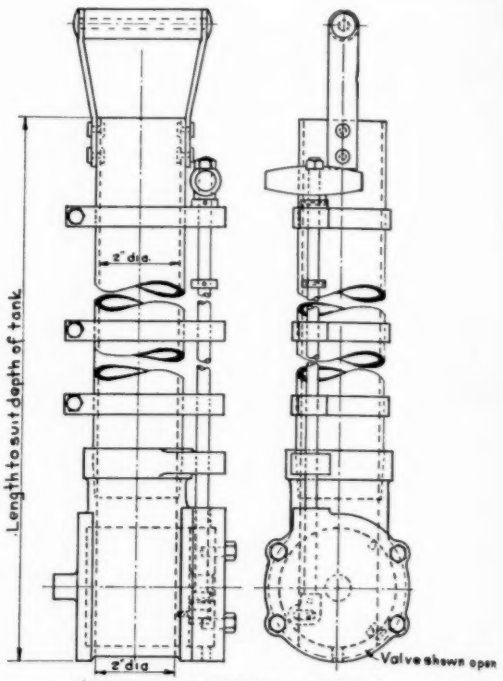
The committee recommends the following changes to be made in the rules of the National Cottonseed Products Association, page 103, (insert the words shown in capitals):

> That the sample was taken vertically through the Oil with a CLEAN AND DRY OFFICIAL trier of uniform diameter . . . . The sample was taken AS PER RULE 242, SECTION 2, so as . . . .

page 105, Rule 242, Section 2, (insert the words shown in capitals):

> Oil, if in tank cars, must be taken vertically through the Oil with a CLEAN AND DRY OFFICIAL trier of uniform diameter . . .

The matter of interpretation of the rules should properly be left to some other committee, however your committee wishes to call to your attention that if our recommendations



OFFICIAL OIL TRIER – TYPE 1
The American Oil Chemists' Society
–1930–

be accepted and incorporated in the rules, it will be necessary to allow a certain time limit in order to enable everybody concerned to supply themselves with at least one Official Oil Trier, Type 1; after this time limit has expired, a sample is not and cannot be an official sample unless taken with an official trier and the official method followed in taking sample and if samples are taken which are not official, it shall be so stated on certificate.

By "clean and dry" we understand that if same or similar oils are being sampled, it is not necessary to clean the trier each time, however when different kinds of oils are being sampled or when refined oils are being sampled, it is absolutely necessary that trier, before being used, previously has been cleaned and dried—this, of course, also applies to containers in which the sample is being placed.

The committee recommends that in future, before any other type of trier is accepted as official trier, same should be passed by the sampling committee and that no trier be sold or advertised as official trier unless recommended by sampling committee and approved by the American Oil Chemists Society. Further, that rules and regulations governing sampling of oils and interpretations of these rules be printed and furnished in pamphlet

form to all official inspectors, samplers and weighers or any other persons doing this class of work.

Respectfully submitted,

(Signed) J. W. BODMAN
R. A. DUNCAN
(Signed) W. C. MOOR
E. F. SAINT PE
V. SERBELL, *Chairman*

Committee on Reprinting Methods

THE changes in the Official Methods adopted at the last meeting of the American Oil Chemists' Society made necessary the reprinting of the first ten pages of the methods. Arrangements were made with the Lefax Company for the printing of these methods at a cost of approximately $85.00 for 2,500 copies.

Unfortunately in a number of instances the Methods of the A. O. C. S. and the methods printed in the Rule Book of the National Cottonseed Products Association are not identical. This is due in part to the fact that some of the methods were not submitted to the Chemists' Committee of the National Cottonseed Products Association for their consideration.

It is very essential that all new methods and changes in old methods be placed in the hands of the Chemists' Committee prior to the meeting of the Rules Committee of the National Cottonseed Products Association in order that they may be adopted and incorporated in the Rules.

In printing the Methods of the A. O. C. S. the Soap Methods were not included. Since these methods are the Official Methods of the Society I recommend that they be added to the Methods when the corrections are made for the coming year.

W. H. IRWIN, *Chairman*

Report of Moisture Committee

THE Moisture Committee this year decided not to send out any cooperative samples but to collect the data on the moisture determination as reported by the collaborators who used the Official Oven of the A.O.C.S. on the Smalley Check Meal Samples. The maximum number of laboratories using the Official Oven was twenty-five and of these the figures of three laboratories were left out of consideration for the reason that they were consistently high or low on practically all samples reported.

In the early part of the work the results were rather poor but there was a decided improvement beginning with the ninth sample. Two tables are given below covering the data collected. In the first table it is to be noted that the spread between the collaborators using the Official Oven is less than half of that reported by those using other types of ovens. The second table covers the work of the individual laboratories and indicates that if conditions are properly watched very close results can be obtained.

The Moisture Committee feels that a great many laboratories do not attach sufficient importance to the determination of moisture. If good results are to be obtained proper attention must be given to the operation of the Oven, the condition of the desiccator, prompt weighing after cooling, etc.

Some of the first Official Ovens manufactured were not satisfactory for the reason that the seams were soldered and leaks developed. This difficulty has now been overcome and satisfactory ovens with brazed seams are available on the market.

The Moisture Committee recommends that for the season of 1930-31 further data be collected covering the moisture determinations on the Smalley Check Meal Samples.

W. H. IRWIN, *Chairman*
N. C. HAMNER
J. D. EVANS
E. W. MAGRUDER
E. H. TENENT

(*Turn to Page* 193)

The General Foods Corporation reports combined net earnings for 1929, including earnings of subsidiaries prior to acquisition, of $20,519,046, equivalent to $3.89 a share on the 5,274,527 shares outstanding on Dec. 31, 1929. The net, excluding operations of subsidiaries prior to acquisition, was equivalent to $3.68 a share, compared with $14,555,683, or $3.10 a share on 4,682,736 shares outstanding on Dec. 31, 1928. Colby M. Chester, Jr., president, says in his letter to stockholders that the ratio of net quick assets to liabilities was 3.7 to 7, representing a decline from the previous year due to "heavy cash disbursements as part purchase price for new companies, purchase of General Foods stock in the open market, and advances to Frosted Foods Company, Inc." The balance sheet discloses total assets of $70,503,782 against $56,546,699 at the close of 1928, while current surplus is $11,824,177 against $9,293,342.

Moisture Results on Smalley Cooperative Samples

(*From Page* 191)

Sample No.	Number of Figures by Official Oven	Official Oven Number within 0.3% of average	Official Oven % within 0.3% of average	Official Oven average % moisture	Official Oven figures spread between high and low	All other figures spread between high and low
1.	21	14	66.3	7.55	0.86	2.01
2.	21	13	61.9	8.64	1.62	3.57
3.	21	16	76.2	8.60	1.08	2.46
4.	22	16	72.7	8.12	1.02	2.25
5.	21	15	71.4	8.53	1.04	3.45
6.	22	17	77.3	8.11	1.34	3.30
7.	22	15	68.2	6.52	1.35	2.88
8.	19	12	63.1	6.91	1.30	2.58
9.	20	15	75.0	7.11	0.96	2.14
10.	20	17	90.0	7.29	1.90	2.58
11.	19	14	73.7	6.53	1.56	3.36
12.	20	16	80.0	7.00	1.60	2.07
13	20	18	90.0	6.36	0.67	2.49
14.	20	15	75.0	6.17	1.01	2.79
15.	19	16	84.2	6.22	1.11	3.16
16.	21	19	90.5	6.48	0.72	1.44
17.	21	19	90.5	6.73	0.72	0.96
18.	21	20	95.2	6.43	0.60	2.34
19.	22	20	90.9	6.15	0.77	1.51
20.	21	20	95.2	6.21	0.58	1.72
21.	22	20	90.9	6.22	1.33	2.07
22.	20	17	85.0	6.18	0.69	1.88
23.	22	21	95.5	6.14	0.66	1.78
24.	22	19	86.4	5.97	0.96	2.70
25.	22	18	81.8	5.82	0.87	1.38
26.	22	18	81.8	5.80	1.15	1.42
27.	22	17	77.3	5.54	0.97	1.60
28.	21	19	90.5	5.92	0.61	1.46
29.	22	20	90.9	5.93	0.83	2.17
30.	21	19	90.5	5.97	0.68	1.69
AVERAGE			81.9		1.02	2.24

Moisture Results on Smalley Cooperative Samples Using Official Oven

Analyst No.	Standing	Number of samples reported	Number of results more than 0.3% higher than average	Number of results more than 0.3% lower than average	Number of results within 0.3% of average	% of results within 0.3% of average
12	1	30	0	0	30	100.0
53	2	29	1	0	28	96.6
1		30	1	1	28	93.3
79	3	30	0	2	28	93.3
80		30	0	2	28	93.3
59	4	25	2	0	23	92.0
73	5	21	2	0	19	90.5
28		30	3	0	27	90.0
40	6	30	0	3	27	90.0
39	7	30	4	0	26	86.7
49		30	0	6	24	80.0
64	8	30	4	2	24	80.0
84	9	18	1	3	14	77.8
65	10	26	1	5	20	76.9
56		30	3	4	23	76.7
57	11	30	7	0	23	76.7
81	12	30	6	2	22	73.3
24		30	7	2	21	70.0
48	13	30	2	7	21	70.0
52		30	3	6	21	70.0
55	14	30	0	10	20	66.7
92	15	29	0	11	18	62.1

Activated Carbons

(*From Page* 173)

retain traces of soap in refined oil, as evidenced by the following tests on refined coconut oil of a known soluble soap content (indicated as sodium oleate).

	Percent Soluble Soap (estimated as sodium oleate)
Refined coconut oil	0.0152%
Same coconut oil decolorized with 1% of imported activated carbon A	none
Same coconut oil decolorized with 1% of domestic activated carbon X	none
Same coconut oil decolorized with 1% of domestic carbon Y	0.0030%
Same coconut oil decolorized with 1% of imported activated carbon B	0.0046%
Same coconut oil decolorized with 1% of imported activated carbon C	0.0055%

Thus it may be seen that all of the five samples of activated carbon used exerted a strong effect of soluble soap reduction, two of the five completely eliminating any final trace of soap in the oil, while the minimum reduction was 0.0097% out of 0.0152%.

The use then of as large a percentage of activated carbon as profitably may be employed from a decolorizing standpoint, and the reduction of decolorizing temperatures to a minimum, would appear to assist the edible oil refiner, especially if he is not properly equipped for vacuum decolorizing. Apparently the presence of such carbon in decolorizing tends to aid in the complete elimination of those objectionable traces of soaps and other impurities, dissolved or held in colloidal suspension in the oil.

Smalley Foundation

(*From Page* 187)

Tables IV—Results of Other Collaborators Whose Results Deserve Recognition

Analyst	No. samples reported on	Points off Oil	Points off Ammonia
6	29	—	28
18	23	—	42
25	29	—	63
32	29	30	34
37	26	447	66
45	27	—	51
60	23	247	70
63	29	47	7
65	26	187	36
73	23	88	59
75	29	—	115
82	29	—	93
87	20	140	36
89	28	315	100
90	28	497	196
92	29	143	96
93	26-27	503	62
97	21-24	380	154

Table V

Showing Degree of Uniformity of Results Reported

	No. reporting	No. Results ± .10	No. Results ± .05	No. Results ± .02	Sample No.
OIL					
Max. deg.	55	49	39	20	29
Min. "	55	38	24	16	23
Aver. "	54	44	34	18	—
AMMONIA					
Max. deg.	89	88	79	47	23
Min. "	90	81	69	39	2
Aver. "	88	85	73	43	—

OIL & FAT Statement of Ownership

Statement of the ownership, management, circulation, etc., required by Act of Congress of August 24, 1912, of Oil & Fat Industries, published monthly at New York, N. Y. for April 1, 1930.

State of New York; County of New York.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Alan Porter Lee, who having been duly sworn according to law, deposes and says that he is the Editor of the Oil and Fat Industries and the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation) etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, and business manager are: Publishers, MacNair-Dorland Co., Inc., 136 Liberty St., New York, N. Y.; Editor, Alan Porter Lee, 136 Liberty St., New York N. Y.; Managing Editor, None; Business Manager, Grant A. Dorland 136 Liberty St., New York, N. Y.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

MacNair-Dorland Co., Inc., 136 Liberty St., New York, N.Y., Ira P. MacNair, 136 Liberty St. New York, N.Y., Grant A. Dorland, 136 Liberty St., New York, N.Y.

3. That the known bondholders, mortgages, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state). None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is_____ (This information is required from daily publications only.)

[Signed] Alan Porter Lee.

Sworn to and subscribed before me this 18th day of March, 1930.

Al. J. Ruggiero, Notary Public, Kings Co., No. 509 Reg. No. 1162; Cert. filed in N. Y. Co., No. 309 Reg. No. 1R242; Commission expires March 30th, 1931.

[SEAL.]

Prices

Candles, adamantine 6s 16 oz.			
20-set cases	**set.**	**.14½**	**.15¾**
40-set cases	**set.**	**.14**	**.14½**
Candles, paraffin, cs., 14 oz., case of			
40 sets	**set.**	**.10**	**.10¼**
6s 14 oz., case of six cartons containing			
36 sets	**set.**	**.11**	**.11¼**
6s 12 oz., 40 set cases	**set.**	**.09**	**.09¼**
6s 12 oz. cases of six cartons containing			
36 sets	**set.**	**.10**	**.10¼**
Patent ends	**set.**	**.17¾**	**.18**
Stearin 6s 16 oz., plain, cases	**set.**	**.16¾**	**.17**
Castor, No. 1, bbls.	lb.	.12¼	.12½
No. 3, bbls.	lb.	.11¾	.12
Chinawood, bbls. or drs.	lb.	.10¾	.11
Coast, tanks, spot	lb.	.09½	.09¾
Futures	lb.	.09½	—
Coconut, Ceylon grade, bbls.	lb.	.08	.08⅛
Coast, Tanks, Domestic White	lb.	.06¼	.06⅜
Cochin grade, bbls.	lb.	.08⅝	.08⅞
Manila, bbls.	lb.	.08	.08⅛
Tanks, N. Y.	lb.	.06¾	.06⅞
Fatty acids, mill tanks	lb.	.10¼	nom.
Cod, Newfoundland, bbls.	gal.	.52	.56
Copra, bags, coast	lb.	.03⅞	.04
Corn, tanks, mills	lb.	.07¾	.07⅞
Bbls., New York	lb.	.10	nom.
Refined, bbls.	lb.	.11	.11¼
Fatty acid	lb.	.08	nom.
Cottonseed, crude, tanks, mills	lb.	.07⅜	—
P. S. Y.	lb.	.08⅝	.08⅞
Fatty acids, mill, bbls.	lb.	.08¼	nom.
Degras, domestic, bbls.	lb.	.03¾	.04½
English, bbls.	**lb.**	**.04½**	**.05**
German, bbls.	lb.	.03¼	.03¾
Neutral, domestic, bbls.	lb.	.07¾	.08½
English, bbls.	**lb.**	**.08**	**.09**
German, bbls.	**lb.**	**.07**	**.07½**
Greases, choice white, bbl. N. Y.	lb.	.06	.07¾
Yellow	lb.	.05⅝	.05¾
Brown	lb.	.05½	.05⅝
House	lb.	.05⅝	.05¾
Herring, coast tanks	gal.	—	nom.
Horse, bbls.	lb.	.09½	nom.
Lard, city, tierces	lb.	.10½	—
Compound, tierces	lb.	.10¾	.11
Middle Western, tierces	lb.	.10¾	—
Neutral, tierces	lb.	.12	nom.
Prime Western, tierces	lb.	.10⅞	—
Lard oil, No. 1, bbls.	lb.	.10⅛	—
No. 2, bbls.	lb.	.09⅞	—
Extra bbls.	lb.	.10¾	—
No. 1, bbls.	lb.	.10½	—
Winter strained, bbls.	lb.	.11¾	—
Prime, bbls.	lb.	.12¾	—
Linseed Oil, boiled, tanks	lb.	.1380	—
Car lots, bbls.	lb.	.1460	—
Less car lots, bbls.	lb.	.1500	—
Less than 5 bbls.	lb.	—	.1540
Double boiled, less than 5 bbls.	lb.	.1570	.1600
Raw, tanks	lb.	.1340	—
Car lots, bbls.	lb.	.1420	—
Less car lots, bbls.	lb.	.1460	—
Less than 5 bbls.	lb.	.1500	—
Refined, bbls.	lb.	.1490	.1530
Varnish grades, bbls.	lb.	.1510	.1550
Linseed cake, bags	ton	37.00	38.00
Meal, bags	ton	44.00	46.00
Menhaden, crude, tanks, Baltimore	gal.	.45	nom.
Light pressed, bbls.	gal.	.58	.60
Yellow bleached, bbls.	gal.	.60	.62
White bleached, bbls.	gal.	.63	.65
Mustard, bbls.	gal.	.90	—
Neatsfoot, cold pressed, bbls	lb.	.17	—
Extra, bbls.	lb.	.10¾	—
No. 1, bbls.	lb.	.10¼	—
Pure, bbls.	lb.	.12¼	—
Oleo, No. 1, bbls.	lb.	.12⅜	—
No. 2, bbls.	lb.	.10⅞	—
Olive, denatured, bbls. N. Y.	gal.	.75	.85
Shipments	gal.	.75	.80
Foots, bbls.	lb.	.07½	—
Shipments	lb.	.07	.07½
Edible, bbls.	lb.	2.00	2.40
Palm, Lagos, casks, spot	lb.	.07¼	.07⅜
Shipments	lb.	.06⅞	—
Niger, casks, spot	lb.	.06¾	.06⅞
Shipments	lb.	.06½	.06⅝
Palm Kernel, pkgs.	lb.	.07⅝	.07¾
Tank cars	lb.	.07⅛	.07¼
Peanut, crude, bbls.	lb.	.09¼	.09¾
Mills, tanks	lb.	.07¾	.08
Refined, bbls.	lb.	.11¾	nom.
Perilla, bbl.	lb.	.12¾	.13
Poppy Seed, bbls.	gal.	1.70	—
Rapeseed, blown, bbls.	gal.	.92	.93
Refined, bbls.	lb.	.67	.70
Red Oil, distilled, bbls.	lb.	.10⅛	.10⅜
Tanks	lb.	.09¼	—
Saponified, bbls.	lb.	.10⅛	.10⅜
Tanks	lb.	.09¼	—
Salmon, coast, tanks	**gal.**	**.35**	**nom.**
Sardine, coast, tanks	gal.	.35	nom.
Sesame, refined, drums	lb.	.12	.12½
Soya Bean, blown, bbls.	lb.	.13	.13¼
Crude, bbls.	lb.	.11¼	.11½
Orient, coast, bbls.	lb.	.10	nom.
Sperm, bleached f.o.b., New Bedford,			
bbls.	**gal.**	**.84**	**.85**
Natural, f.o.b., New Bedford, bbls.	**gal.**	**.78**	**.80**
Stearic Acid, Double pressed, bags	lb.	.14½	.15
Triple pressed, bags	lb.	.16½	.17
Stearine oleo, bbls.	lb.	.09	.09½
Tallow, edible, bbls.	lb.	.07¼	.07½
City, extra, works, loose	lb.	.06½	—
Special, works, loose	lb.	.06¼	—
Tallow, oil, acidless, bbls.	lb.	.09¾	—
Tanks, N. Y	lb.	.09½	—
Vegetable tallow, coast, mats	lb.	.07⅛	—
Whale, crude, No. 1, coast, tanks	**lb.**	**.07**	—
No. 2, coast, tanks	**lb.**	**.06½**	—
Refined, winter bleached, bbls.	**gal.**	**.80**	—
Extra, bbls.	**gal.**	**.82**	—
Natural, bbls.	gal.	.78	—

1340 –
1420 –
1460 –
1500 –
1490 .1530
1510 .1550
00 38.00
00 45.00
45 nom.
58 .60
50 .62
53 .65
90 –
17 –
10¾ –
10½ –
12¼ –
12⅜ –
10⅞ –
75 .85
75 .80
07½ –
07 .07½
00 2.40
07¼ .07⅜
06⅞ –
06¾ .06⅞
06½ .06⅝
07⅝ .07⅞
07⅛ .07¼
09¼ .09½
07¾ .08
1¾ nom.
2¾ .13
0 –
2 .93
7 .70
0⅛ .10⅛
9¼ –
0⅛ .10⅛
9¼ –
5 nom.
5 nom.
2 .12½
3 .13¼
1¼ .11½
0 nom.
4 .85
3 .80
4½ .15
5½ .17
9 .09⅛
7¼ .07⅞
5½ –
5¼ –
9¾ –
0½ –
7⅛ –
– –
5⅛ –
0 –
2 –
3 –

Market Report on
FATS, OILS AND GREASES

(As of April 28, 1930)

NEW YORK—There were fewer price changes in the market for oils, fats and greases during the recent period than there have been in any period during the last year. Instead of the usual report of numerous changes, all to lower levels, the report for the recently concluded period consists of only a few revisions in quotations, and a number of these represent higher rather than lower prices. It is the belief in some sources that the long bear market is about at an end, it being apparent that quotations on some products have reached rock bottom. Considerable strength was noted in coconut oil and copra during the period. Future quotations are now higher, and sellers who were previously making very favorable offers are not now so anxious to sell. Corn oil also advanced during the period after months of declining prices, the gain being attributed to the stronger position of grain and competing oils. Cottonseed oil showed considerable strength early in the period when a scarcity of seed and a lack of offers pushed the price up. Conditions were quieter at the close, as interest in the market lagged. Tallow again declined in price. Olive oil continued to be priced much under the quotations of a year ago, due to abundance of stocks. Other oils to show declines in quotations were China wood oil, lard oil, neatsfoot oil, salmon oil, sardine oil, and tallow oil. Lard was fractionally higher, as were peanut oil, soya bean oil and stearine.

Chinawood Oil

Chinawood oil barrels were quoted at 10¾c to 11c a pound at the close of the recent period, a reduction of ½c lb. from the close of the previous period. The market was quiet after the decline, with fewer offers from sellers.

Coconut Oil

Copra and coconut oil were stronger in all markets at the close of the recent period. Futures which were refused by buyers last period were withdrawn from the market during the recent period by sellers who were no longer particularly anxious to let their stocks go at the low levels which now prevail. Consumers are showing more interest in the market at this point, since they intend to make sure that their storage tanks are full of oil purchased at low levels, before any recovery starts in.

Corn Oil

There was an advance in the price of corn oil during the period, quotations on mill tanks ranging from 7¾c to 7⅞c lb. at the close. Offerings from producers were small. The grain markets have been stronger recently.

Cottonseed Oil

An early rise in the price of refined cottonseed oil was partially offset later in the period by a return of quiet conditions. Quotations at the close were 8⅝ to 8⅞c lb., an increase of ¼c lb. over the closing quotation of last period. Crude oil was also slightly higher, being quoted at 7⅜c lb.

Grease

No changes were quoted in grease prices during the period, in contrast to the steady and severe decline which has characterized the past few months.

Lard

Lard quotations were slightly higher during the period as demand entered the market in better volume. City tierces were offered at 10½c lb., ¼c lb. above the close of last period. Other items in the list were also quoted higher.

Tallow

A small decline was noted in the price of tallow which closed at 6½c lb. for city extra material, ⅛c lb. under the close for last month. Offerings were larger, contributing to the weakness of the market.

OIL & FAT INDUSTRIES

The Editor's Page

The Times — and Business

WHENEVER there appears upon the business horizon the slightest cloud of a temporary recession from "Boom Times," the Harpies of the business world are ever ready to spread gloomy tidings and to predict calamity and disaster for the future. To a certain extent American business has been passing through such a period since the stock market debacle of last October.

In the course of some recent travel about the country, however, it has seemed to us that the United States is still in existence. In conversation with many manufacturers, we have been most impressed by the fact that those who are attending to the business of producing and selling, without lost motion or calamity howling, are still doing business at the same addresses. It is true that periods such as the present are most difficult for the "marginal producers." Those who have soared on the crest of the wave and overextended their facilities on a rising market find themselves confronted by the necessity of stern retrenchment. Those who have overlooked the paramount importance of keeping their manufacturing processes abreast of the times, in order that they may meet the keenest competition in the markets without sacrifice of their fair manufacturing profits, are in the unfortunate situation of selling their products at a loss, or of not selling at all.

How different is the position of the well-intrenched manufacturer who has foreseen such situations: who knows his costs and who by the application of scientific study to his processes has kept those costs within the bounds of his industry's best: who has maintained the quality of his products uniformly at such a high level that his customers insist upon his products and are willing to pay a fair price for them: who, by consistent well-planned advertising has created and fostered a steady demand for his goods in every market that he can reach with his deliveries, without attempting to "blanket the earth" or to get *all* the business, whether profitable business for him or the reverse: who, by fair treatment of his employes in good times and bad, has so strengthened their morale that they, because of their confidence in him and their affection for him, work just a little harder to increase business and to reduce costs and improve quality: who has so ordered his financial affairs that his liquid capital is working for him instead of being "frozen" in top-heavy inventories of slow-moving materials and products: who, in short, has just been "paying attention to his business" at all times. Surely such a one is "blessed of the gods" and will keep right on doing business on an upward-sloping line that plows steadily through the peaks and valleys of all statistical condition charts.

Scientific Seed Grading

AT THE recent conventions of the American Oil Chemists' Society and the National Cottonseed Products Association held in New Orleans last month the outstanding achievement was the adoption by both bodies of new rules for the grading of cottonseed for purchase by the oil millers.

Throughout the past history of the cotton oil milling industry the miller has purchased seed at the market price or at whatever premium a scarcity of seed in his particular territory might impose upon him, with little or no regard to the quality of the product which he received in exchange for his money.

When, on the other hand, he came to market *his* products, the oil, the cake and the linters produced from the seed, he found himself subject to a well-developed and established series of rules governing quality, weights, terms and all other considerations affecting the sale contract. In addition, in the course of his operations it became apparent that the actual yield of oil varied in amount from different lots of seed, as well as the quality of the oil and the other products. Since the oil is by far the most valuable product produced from the seed, a slight reduction in the normal yield of oil from any particular lot of seed may well mean the difference between profit and loss for the miller on the handling of that lot.

While this condition has long been a source of extreme dissatisfaction to the oil millers, it has heretofore appeared insurmountable, because of the extreme difficulty of establishing standard grades for seed which would take into account all of the factors which affect its qualities, including the amount of oil which it would yield and the quality of that oil.

Now that useful branch of Government, the United States Department of Agriculture, has come to the rescue and through the efforts of several of its devoted scientists has established a standard method for grading cottonseed which, by properly evaluating the contained percentages of moisture, ammonia, tare, oil and free fatty acid in the oil, gives the miller a true picture of the values which he may expect to recover from each lot of seed purchased. From this he can quickly figure the highest price he can profitably pay for the seed. Thus is recorded yet another important contribution of science to industry.

Whale Oil and History

LATE last month, the famous whaler, C. A. Larsen, sailed into New York Harbor with some 75,000 barrels of oil in her tanks and proceeded to her destination at the pier of a Staten Island soap plant. Aboard her when she arrived were a group of men returning to civilization after a year or so spent in the Antarctic, members of the famous Byrd Expedition. While the whaler went about the business of discharging her cargo, the explorers went ashore to receive the honors due them after their great scientific adventure among the frozen wastes near the South Pole.

In writing the history of explorations in the Antarctic, the whaling fleet during the season just closed has played a prominent part. Incidental to the business of whaling, its knowledge of the treacherous ice pack, and its familiarity with the Antarctic seas, were of inestimable value to the explorers. What would be unbearable hardships to the average layman, are but part of the day's work among the whalers. The hardships are borne in order that their enterprises may pay dividends. Aiding in scientific explorations, writing history, are merely sidelights of a picture of cash profits for investors back home.

How little the consumer of the bar of soap in America or margarin in Europe appreciates that the products in the making have rubbed elbows with history, particularly more recent history of explorations in the Antarctic.

Helsingfors Margarine Factory

A report from the Commercial Attache at Helsingfors states that a new factory for the production of oleomargarine has been opened by the Finnish co-operative O. T. K. The new factory is located at Sornas, a district of Helsingfors, in a building of seven stories. The walls of this building are lined with glass and tile and there is a laboratory for the control of manufacture.

Dr. D. Tourtelotte, of Baltimore, has been appointed to the Research Fellowship of the Mayonnaise Products Manufacturers of America, Inc., and will enter upon his new duties about June 15th. The work of the Fellowship will be conducted in the laboratories of the Department of Agriculture at Washington on a cooperative basis with the Bureau of Chemistry and Soils. The Mayonnaise Fellowship has been made possible through the generosity of the American Can Company to the Association.

Aluminum cooking utensils have no selective destructive action on the antiscorbutic vitamin of milk, according to the results of the experiments carried out at Mellon Institute of Industrial Research, Pittsburgh, Pa. There has been a growing tendency to boil milk whenever it is to be used in supplemental feedings, or whenever a supply is of doubtful origin. In the Mellon Institute experiments milk was boiled lightly for five minutes in aluminum or glass containers. Some destruction of vitamin C occurred in each case as a result of the boiling, but the metallic utensils exerted no greater action than did those of glass. Another interesting observation was that winter milk from ensilage-fed cows is practically as potent in vitamin C as the best summer milk from cows on pasturage.

The use of saffron or turmeric in mayonnaise for the purpose of heightening the natural egg-yellow color has been prohibited by the Food Standards Committee of the Department of Agriculture.

Directors of the Van Camp Packing Company have voted to pass the quarterly dividend now due on the company's 7 percent preferred stock.

The absorption of hydrogen by oils in hydrogenation with a nickel catalyst is diminished by as little as two percent of nitrogenous matter in the oil. *Seifensieder-Ztg.* 56,248 (1929)

Oil Chemists Meet At New Orleans

Twenty-first Annual Convention Featured by Enthusiastic Attendance and Many Interesting Scientific Papers

ON Thursday, May 8th, the Twenty-first Annual Meeting of The American Oil Chemists Society was called to order by President W. R. Stryker at the Roosevelt Hotel, New Orleans, Louisiana. There was present a large and representative gathering of the membership, including many from points quite distant from New Orleans.

After an Invocation by Reverend J. S. Land, of the St. Charles Avenue Presbyterian Church of New Orleans, the Meeting was officially opened by the President. The reading of the Minutes of the previous Annual Meeting was abridged, and after calling First Vice-President W. H. Irwin to the Chair, President Stryker delivered his Annual Address, which was referred to the Governing Committee.

J. C. P. Helm presented the Annual Report of the Secretary-Treasurer, which was referred to an auditing committee consisting of C. H. Cox, T. B. Caldwell and J. J. Ganucheau.

The reports of the Membership Committee, the Sampling Committee and the Governing Committee were next presented to the members. The report of the Sampling Committee was referred to the Committee on Uniform Methods.

At this point a diversion from the regular order of business was taken to receive an announcement in reference to the Golf Tournament from N. C. Hamner, Chairman of the Tournament Committee.

Dr. George S. Jamieson, Chemist in Charge of the Oil, Fat and Wax Laboratory of the Bureau of Chemistry and Soils of the United States Department of Agriculture, presented a scentific paper entitled "Rubber Seed Oil," which was received with great interest by the members present. Dr. Jamieson also submitted his final report on "Study of Methods of Cottonseed Analysis."

The reports of the Color Committee and the Refining Committee were submitted by the Chairmen, W. D. Hutchins and C. B. Cluff, respectively. Both reports were referred to the Uniform Methods Committee for consideration and report to the Society.

The report of the Uniform Methods Committee was submitted to the Society by J. J. Vollertsen, Chairman, setting forth in detail the recommendations of the Committee covering the reports and work of the various methods committees. Upon motion, each recommendation of the Uniform Methods Committee was adopted by the Meeting. The report of the Uniform Methods Committee will be published in full in *Oil & Fat Industries.*

Thomas C. Law, Chairman of the Chemists' Committee of the National Cottonseed Products Association and Past President of the Oil Chemists' Society, addressed the Meeting on the relationship of the Methods of the Society and those of the Cottonseed Products Association. Mr. Law laid before the Meeting the recommendations of the Chemists' Committee of the Cottonseed Association for changes in the current methods, with particular reference to the incorporation of Seed Analysis Methods as developed by Dr. Jamieson. The Society adopted as Official the methods of Seed Analysis as developed by Dr. Jamieson and upon motion of Mr. Law, seconded by Mr. Vollertsen, a rising vote of thanks was extended to Dr. Jamieson for his valuable contribution to the Society's work in the development of these methods.

After appointment by President Stryker of Nominating and Resolutions Committee, the meeting was adjourned until the following day.

Second Day, May 9th

THE adjourned Annual Meeting was called to order by President Stryker at 9:45 A.M. on Friday, May 9th.

The report of the Soap Section was presented by W. H. Irwin in the absence of A. K. Church, Chairman. The Soap Section Report will be published in full in *Oil & Fat Industries.* Mr. Irwin also presented the reports of the Moisture Committee and of the Joint Com-

mittee on Fat Analysis of The American Chemical Society and the American Oil Chemists' Society.

The report of the Kreis Test Committee was submitted by A. S. Richardson, Chairman.

A most interesting paper entitled "Solvent Extraction—The New and Better Way," was presented by David Wesson. Dr. Wesson exhibited samples of refined cottonseed oil and cottonseed meal prepared by the extraction process which were both of the most superior appearance and quality.

The report of the Detergents Committee, in the absence of J. G. Vail, Chairman, was read by H. P. Trevithick.

Henry Stevens, Research Fellow of the National Cottonseed Products Association presented a paper on "Nutrition Studies on Cottonseed Meal."

W. H. Irwin submitted the reports of the Referee Examining Board and of the Committee on Publication of Methods, both of which reports have appeared in full in *Oil & Fat Industries*.

A. D. Barber, of the Ontario Research Foundation presented a scientific paper entitled "The Use of the Kaufman Thiocyanogen Value in Fat Analysis." Dr. Barber's paper was illustrated by means of lantern slides and evoked considerable interest and discussion.

In the absence of H. C. Moore, Chairman of the Smalley Foundation Committee, the report of this Committe was presented by G. Worthen Agee. Mr. Agee called attention to the exceptionally high average of analytical results obtained by the participants in the Smalley Foundation Check-meal analyses during the year just past. There was some discussion of the proposal to report nitrogen as nitrogen, rather than as ammonia, in order to follow the practice in reporting fertilizer analyses, but the consensus of the opinions of members present was that the present style of reporting, (as ammonia), should be continued.

A scientific paper entitled "Continuous Hydrogenation," descriptive of the Bolton and Lush continuous processes employing fixed permanent nickel catalyst, by E. L. Lush, was presented by Alan Porter Lee, representing Mr. Lush. Samples of various types of hydrogenated oils produced by the continuous process were exhibited and distributed to the members present.

Robert Schwarz presented a paper entitled "A Rapid Method for Determination of Fat Content in Cottonseed Meal and Meats," illustrating the new method by means of special apparatus devised for the purpose.

The special committees appointed at the Meeting on Audits and Resolutions then presented their reports. The Auditing Committee reported that upon examination of the books of the Secretary-Treasurer they found all accounts correct and in order and that all securities were checked by them and found to be correct as shown by the books. The Resolutions Committee recommended suitable action in respect to the members deceased during the past year, namely H. B. Battle, Lehman Johnson and John Kyle. The committee also proposed suitable resolutions of thanks to the Roosevelt Hotel for the facilities provided for the meeting, to the Metairie Country Club for the Golf Tournament arrangements and to the New Orleans members for their successful conduct of the meeting and their entertainment of the visiting members.

Upon motion, seconded, the Secretary-Treasurer was instructed by the Meeting to address letters of thanks to the donors of the various prizes for the golf tournament.

The Nominating Committee reported the following nominations:

For President: W. H. Irwin, Chicago, Illinois; First Vice-President: A. S. Richardson, Cincinnati, Ohio; Second Vice-President: M. M. Durkee, Decatur, Illinois; Third Vice-President: L. B. Forbes, Little Rock, Arkansas; Fourth Vice-President and Chairman Soap Section: Archibald Campbell, Cincinnati, Ohio.

No other nominations were received and all the officers as nominated by the Nominating Committee were unanimously elected to serve during the coming year.

The Governing Committee nominated the Secretary-Treasurer, Mr. J. C. P. Helm, of New Orleans, Louisiana, to succeed himself in office and his re-election was also unanimous.

David Wesson announced that the Annual Banquet would be held on the same evening in the roof-garden restaurant of the Hotel Jung.

President Irwin assumed the Chair and there being no further business the Twenty-first Annual Meeting of the American Oil Chemists' Society was declared adjourned.

Referee Applicant

W. M. Black, of Augusta, Georgia, has applied for certification as Referee Chemist of the American Oil Chemists' Society. (*First publication.*)

Irwin Heads Oil Chemists

New President Is Chemist with Swift and Co., Chicago; Vice-Presidents Represent Varied Interests

ON MAY 9th, The American Oil Chemists' Society, assembled at its Twenty-first Annual Meeting at the Hotel Roosevelt, New Orleans, Louisiana, unanimously elected William H. Irwin, of Chicago, Illinois, to be President of the Society during the year 1930-1931. Mr. Irwin is Assistant Chief Chemist of Swift and Company, and is one of the best known and most liked members of the Society. He is also an indefatigable worker, and the Society can be assured of a successful year during his tenure of the office of President.

The new President of the Society was born in Iowa, but removed at an early age to Lawrence, Kansas. Upon completing his college training at the University of Kansas, he entered the employ of Swift and Company at their Kansas City, Kansas plant, where he and his brother established the second laboratory in the Swift and Company organization in 1899. After a brief period spent at Chicago, Mr. Irwin became Chief Chemist at the St. Joseph, Missouri laboratory of the company in 1900, in which position he remained until 1912, when he was transferred to Chicago as Assistant to Dr. W. D. Richardson, Chief Chemist. Mr. Irwin has been active in the Chicago Section of the American Chemical Society, having been treasurer of the Section in 1919. He has been an active member of the American Oil Chemists' Society for many years and has contributed freely of his time and efforts in the advancement of the work of the Society. One of his outstanding accomplishments has been the development of the Society's Standard Moisture Oven, which has placed the determination of moisture percentages upon a high plane of accuracy.

The new President's recreational activities include tennis, golf, hunting, fishing and other outdoor sports.

Vice-Presidents

THE new Vice-Presidents of the Society are: First Vice-President, A. S. Richardson; Second Vice-President, M. M. Durkee; Third Vice-President, L. B. Forbes; Fourth Vice-President and Chairman of the Soap Section, Archibald Campbell.

W. H. IRWIN
President A. O. C. S. 1930

Mr. Richardson is in charge of Research in the Chemical Division of The Procter and Gamble Manufacturing Company at Cincinnati, Ohio. He has been active for some years in the affairs of The American Oil Chemists' Society.

(*Turn to page* 235)

Nutrition Studies on Cottonseed Meal

Presented Before the Annual Meeting of American Oil Chemists' Society, New Orleans, May 9, 1930

By Henry Stevens[1]

AT the May, 1929, meeting of the Interstate Cottonseed Crushers' Association a very extensive outline was adopted as a guide to a series of nutrition studies to be carried out in cooperation with the Bureau of Chemistry and Soils of the United States Department of Agriculture. In accordance with this outline, plans were laid last August for a comprehensive program of investigations which would provide new information of more than theoretical interest and which would lead toward the solution of some of the problems related to the feeding of cottonseed meal. The history of the use of cottonseed meal as a feedingstuff has been given by Macy[2].

Although this investigation was undertaken mainly to determine the nutritional value of the proteins in cottonseed meal, and this paper is really a progress report on this work, information on other nutritional factors in cottonseed meal have come to light. Our experiments have demonstrated that commercial cottonseed meal contains in unexpected abundance two well known vitamins, vitamins B and G. These vitamins are essential for the growth and development of man and many animals, but since their names carry no significance as to their properties you may wish to know some facts about them before considering the results of our experiments.

Vitamin B is a water and alcohol-soluble substance of unknown composition widely distributed in plants and grains in varying amounts. A deficiency of this vitamin in the diet is indicated by an early failure in growth, loss of appetite, and in man, if the deficiency is marked, there follows a serious and complex type of nervous degeneration leading eventually to the disease beriberi. A similar disease can be produced in animals.

The disease pellagra is probably familiar to some extent to all of you who have lived in the South where this malady has at times developed to endemic proportions, but you may not be familiar with the fact that in 1926 Dr. Joseph Goldberger of the Hygienic Laboratory, United States Public Health Service, demonstrated that this disease is owing to the lack of a specific substance in the diet. This substance, also of unknown chemical composition, is now called vitamin G. Lean meat, fish, eggs, and milk are known to be good sources of this factor.

In the experiments I am about to describe, albino rats were used, as for many reasons these animals are now recognized as being most suitable as test animals in nutrition experiments.

Experimental Program

THE first problem of the general program that we planned to attack is that concerned with the nutritive quality of the proteins as they come to us in commercial cottonseed meals. The results of such a study will lead to information of immediate practical value and furthermore will serve as a groundwork for other phases of the investigation. One method of determining the biological value of a protein is to provide the experimental animals with a diet that is satisfactory in all respects, except that it contains no protein or other nitrogen-bearing material, and then determine how much of the material under investigation, cottonseed meal in this instance, must be added to the diet to produce the desired response in growth rate. Information obtained from such experiments points the way to an intelligent selection of other protein concentrates to supplement just those protein deficiencies that may occur in the protein under investigation.

Since the growth rate of the animals is one important criterion in the study of the nu-

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1 Working under fellowship of the National Cottonseed Products Association.

2 Historical Notes on Cotton Seed as Food. By I. G. Macy. J. of Dairy Science, vol. 4, 1921, p. 250.

tritive quality of any new substance, it is obvious that all substances other than the one under test must be supplied in abundance. It is always necessary, therefore, to include in the ration of the experimental albino rat some ingredient that will provide an adequate quantity of the two essential factors which I have described, vitamins B and G. A deficiency of either of these vitamins leads to an early and abnormal slowing of the growth rate and eventually to the development of specific diseases, as previously indicated.

As yet, vitamins B and G cannot be prepared in such degree of purity that the concentrates do not contain nitrogenous constituents of unknown nature and the inclusion of these materials would of necessity invalidate a clear-cut evaluation of the proteins under investigation. Therefore, our protein studies would be more conclusive if the cottonseed meal we were feeding as a source of protein would at the same time serve as an adequate source of the water-soluble vitamins.

Our first experiments, therefore, were designed to demonstrate how low a level of cottonseed meal could be used in the diet as the sole source of these vitamins and still provide them in entirely adequate quantities to permit growth at the maximum rate. The results indicated that cottonseed meal is an unusually rich source of both vitamins B and G. This unexpected fact warranted further investigation of the quantitative relations of each vitamin, B and G. Accordingly, experiments were undertaken to bring out to what degree commercial cottonseed meal would compare with the best quality of pure, dried yeast of known vitamin potency. Yeast is taken as our standard since it has been and is today by far the richest natural source of both vitamins B and G.

Vitamin-Content of Meal

IN one ration 5 per cent of cottonseed meal constituted the sole source of the water-soluble vitamins. A control ration carried in addition 5 per cent autoclaved yeast which we had previously shown to be free from vitamin B but a good source of G. At this low level of cottonseed meal the growth rate was fair, the rats receiving the vitamin G supplement showing the better response. When the level of cottonseed meal was increased to 10 per cent the growth rate approximated the optimum and the addition of vitamin G produced but little response. These experiments have demonstrated that commercial cottonseed meal even in the unrefined state approximates yeast as a source of both these vitamins, and so far as we know now it is the only substance that does.

As regards farm animal feeding our demonstration is ahead of the story, for we do not yet know to what extent animals other than the rat and dog are dependent upon these factors for normal growth and development.

This work on the water-soluble vitamins is a valuable and interesting by-path that was followed while laying the foundation for a thorough investigation on the nutritive quality of the cottonseed proteins as they appear in the commercial meals. In the protein phase of the program also we feel that creditable progress has been made, although our data are inadequate at present to make any quantitative interpretations. We have constructed for our animals a suitable diet in which cottonseed meal provides the only source of protein. Carbohydrate and energy requirements are met by including dextrinized cornstarch; the minerals are balanced by using a combination of chemically pure salts. Vitamins A and D are supplied in a low level of 2 per cent of cod liver oil of tested potency. Since we have established the potency of the cottonseed meal in vitamins B and G, we no longer need to complicate our interpretations by including a component that would bring another source of proteins into the experiment.

Preliminary trials indicate that the cottonseed meal provides proteins of exceptionally high quality. Until we have had time to compare meals from different sections of the country prepared under somewhat varying conditions, however, we shall not be justified in making any broad statements about this phase of the work.

I would not consider this report of progress complete without a word of tribute to the excellent facilities and whole-hearted cooperation that I have enjoyed in the Protein and Nutrition Division of the Bureau of Chemistry and Soils. Progress in a problem involving the use of laboratory animals cannot be made by independent industry. The nature of this work makes many and unusual demands on the staff and necessitates extra or special equipment. It is no exaggeration to state that there is no laboratory in the country better equipped and but few as well equipped for this work, and the Association has the further advantage of knowing that the work is done in cooperation with some of the most able men in the field of nutrition.

Food Supplies and the Cotton Crop

Address Presented Before the Annual Convention of the American Chemical Society, Atlanta Ga., April, 1930

By David Wesson

FEW people realize the important place which the products of the cottonseed have taken in augmenting our food supply during the past quarter century. Every bale of cotton ginned sends to the oil mills 690 to 700 pounds of cottonseed. With a 15,000,000 bale crop such as we had last year, the mills received 5,000,000 tons of seed. This may seem small from a tonnage standpoint when compared with the great cereal crops of the country, but when the concentration of protein and that of oil in the different crops are considered, we can readily see that the cottonseed stands pre-eminent.

TABLE I

	Protein	Oil
Cottonseed	17.2	20. %
Wheat	13.2	1.6
Oats	12	6
Corn	10.6	6.5
Potatoes	2	.6

The cottonseed is poor in carbohydrates. It is a highly concentrated fat and protein food source, and when we compare it with the leading food crops as in Table 2, we see the effect of this concentration.

TABLE II

	Greater than Cottonseed crop	Protein	Oil
Corn	16 times	8-9 times	5 times
Wheat	5 "	3 "	38%
Oats	4 "	2½ "	1¼
Potato	2 "	20%	2%

Referring again to Table I, it is evident that the cottonseed is the only product which contains the fat and protein sufficiently concentrated for the ready manufacture of food products rich in these essential food elements. The large quantity of oil in the corn crop is concentrated in the germs which are separated before the manufacture of starch and the corn sugars. The production of corn oil amounts to about 10% as much as that from the cottonseed, which at the present time is one of the three chief sources of edible fats in this country viz: butter, cottonseed oil, hog lard. At the present time, with a fifteen million bale cotton crop, the annual production of crude cottonseed oil is about one billion one hundred and fifty seven million pounds, losing about 8% in its conversion into refined oil suitable for edible purposes.

If we had to depend on lard for shortening and cooking fat, there would be about half enough to meet our needs. In other words, the cottonseed oil, perfected by modern methods of refining and hydrogenation, furnishes half of our shortening and 75% or more of our salad oils. As a manufacturing process, crude oil refining is fairly satisfactory as 96.5% of the available refined oil is obtained.

The same cannot be said of the methods by which crude oil is produced from the seed. Mechanically they are highly developed, but when we consider that with the present method of pressing, only 85% of the oil is recovered, it is quite evident that the mechanical methods of pressing fall far behind, in efficiency, the chemical methods of refining.

The average milling results per ton of seed at present are as follows:

Oil	309	lbs.
Cake and meal	888.9	"
Oil left in cake and meal	55	"

In other words, 15.5% of the total oil is left behind in the cake which is ground into meal and used for cattle food. The recovery of only 84.5% is a strong indictment against modern manufacturing methods. Alas, this is only a small part of the story. Let us look again to Table I, which shows that cottonseed contains practically as much protein as it does oil. Average figures would be somewhere around 17 to 17% protein to 18 to 20% oil, according to locality. Protein, as everybody knows, is the most important, as well as the most expensive food element of our diet. Its cost depends on the form in which we buy it. The following table gives an idea of what we are paying for it in our common foods:

TABLE IV - A

As Purchased	Protein per cent	Price per lb.	Protein Cost
Roast beef	15	35	$ 2.32
Sirloin steak	16	50	3.12
Lamb chops	15	50	3.33
Ham (smoked)	16	35	2.50

Chicken	14.8	40	2.70
Turkey	16	50	3.12
Cod fish steak	18.5	25	1.35
Mackerel (fresh)	10	20	2.00
Salmon	12	30	2.50
Oysters	7.4	25	3.38
Lobster	4.6	50	13.
Milk	3.3	10	3.00
Cheese (American)	29	35	1.20
Peanuts	17.3	15	.87
Beans	22.3	10	.45

It will be noticed the animal proteins are the most expensive, while that of beans, the stand-by for vegetable protein, is the lowest priced. There is a reason. Bean protein is less digestible than that from animal sources. It also has lower biologic value. It does not promote growth nor repair tissues as does the animal protein. The protein of the cottonseed has been found to have high biologic value and for this reason, is worth from a dietary standpoint, more than that of the bean. Supposing for a minute that the protein of the cottonseed could be eaten as a human food and could be purchased at the same price as that of beans. The 360 pounds of protein in a ton of cottonseed would be worth at 45c per pound, $162.

As already shown, the meal from a ton of cottonseed is 889 pounds. This contains all the protein and sells today at $37.50 per ton. Therefore the protein in a ton of cottonseed brings $16.62 per ton of meal. The 309 lbs. of oil from a ton of cottonseed at 8c for crude would be worth $24.72 or $40.34 for the oil and protein in a ton of seed, as against $162 for the protein alone if it were properly utilized as a human food instead of being sold in a cattle food for less than 5c per pound. Let us suppose that chemical instead of mechanical methods were used for extracting the oil from the seed. A ton of seed would then yield as follows:

Oil 360 lbs. @ 8c	$28.80
Oil 360 lbs. @ 8c	$28.80
Edible (residue) 700 lbs. containing 360 lbs. protein at	162.00
Making value of oil and meal per ton of seed	$190.80

This looks like almost a 400% proposition. It would be a pipe dream or an air castle were it not for certain well demonstrated facts:

First—Cottonseed meal as now made containing 6% or more of oxidizable oil gums, resins and gossypol, can never be a successful human food, on account of its flavor and poor keeping quality.

Second—Removing the above mentioned by-product, we have a sweet almost tasteless flour-like body which will keep as well as wheat flour. This carries 50 to 60% protein, or 2½ to 3 times as much as is found in meat, and is available for human food.

Third—The extra oil removed by solvent extraction amounts to 50 to 55 lbs. per ton of seed. It costs no more to get it out than press-room work, and the result produced by refining is *better*.

Fourth—The protein residue, when properly prepared is palatable and nutritious. It not only can be eaten but has been eaten by many people.

Fifth—Words without works are worth little. The samples I have prepared give ocular evidence, obtained on a semi-commercial scale, showing what has been accomplished.

There was a time not so many years ago, when cottonseed oil was considered fit mostly for the soap kettle and as an adulterant for other oils and lard. It has been sold as low as 3c per pound and now in the refined form brings 10c per pound and better, and there is little left for the soap kettle. Today it is a necessity in the American dietary.

The protein product after extracting the oil, is a far better one than the cotton oil of yesterday. It has been named Wessona. When mixed with vegetable shortening and water to simulate meat, a meat substitute costing about 5c per pound can be produced. It can be used in hash, croquettes, meat loaf, sausages, sandwich fillings, etc. Such a product would be a boon to the poor and furnish cheaply the needed protein to combat pellagra in the South.

The cotton crop contains enough protein to meet the needs of over 50 million people. The utilization of the protein of the cottonseed as a human food, would add immeasurably to the value of the cotton crop. This would be a real farm relief measure free from politics and Congressional oratory. The farmer did not ask for Congressional relief when applied chemistry by rational refining methods brought the value of his cottonseed from $8.00 a ton to the present price of $37.00. During the War it went to $85.00 a ton. If Congress, instead of trying to find out why cottonseed oil mills will not pay more for the cottonseed than they can get for its products after the expense of milling, would devote its energies and investigational activities and appropriations to chemical research to the end that the cottonseed would find its proper place in our food markets, they would be giving aid not only to the farmer but to the whole people.

This paper is presented in the hope of furnishing food for thought, and bringing a new food product to your attention.

Few Changes in Oil Tariff

THE tariff rates on oils and fats as they appeared in the finished Hawley-Smoot Tariff Bill differ but little from the general rates of the Fordney Tariff Act of 1922. The duties on linseed and soya bean oils have been raised, and four oils have been added to the denatured class along with olive oil. The chief soapmaking oils and fats remain unchanged, coconut and palm oils still being on the free list, and the duties on tallow, whale and fish oils, and castor oil unchanged. The report of the Bureau of Raw Materials for American Vegetable Oils and Fats Industries on the oil and fat sections of the bill, states in part:

"China wood oil, perilla oil, palm oil, cod liver oil, and cod oil remain on the free list. These may each be imported in their natural state; none of them are required to be denatured. In the case of the denaturing provision, additional oils had been added by the Senate. These oils were rapeseed, sesame, and sunflower. These three oils, together with olive oil (which includes sulphur olive oil) and palm kernel oil, are accorded duty free entry if rendered inedible by the use of a suitable denaturant. The denaturing provision was retained intact in the bill in precisely the form in which it passed the Senate.

"They adopted the Senate rate of 4½c per pound on linseed oil. In the case of sperm oil, they restored the House rate of 10c per gallon on the crude as opposed to 6c per gallon in the Senate bill, and the 14c per gallon rate on refined which was established in the House bill in place of the 12c per gallon for refined which was written into the Senate bill. Soya bean oil was raised from 2.8c per pound in the Senate bill to 3.5c per pound, a compromise between the House rate of 5c per pound and the Senate rate. In view of the fact, however, that the 2.8c per pound was too high for the transaction of any important volume of business, it is not likely that the 3.5c rate will result in any material diminishment in the amount of business which can be transacted in respect to soya bean oil.

"Two additional oilseeds which were added by the Senate to the oilseeds paragraph which may be imported duty free into the United States, i. e., kapok and rubber seed, were retained on the free list, along with copra, sesame seed, palm kernels, perilla seed, tung oil nuts, and all other oilseeds which could be imported into the United States free of duty under the Tariff Act of 1922. These two items, with rapeseed oil and sunflower oil, represent definite additions to the free list in the pending Tariff Act.

"All other oils and fats remain precisely as in the Act of 1922, whether of vegetable, animal, or sea animal origin. Vegetable tallow remains on the free list. Tallow remains at the 1922 rate of duty which is ½c per pound. Whale oil continues to bear its old duty of 6c per gallon. Herring and pilchard oils retain the 1922 rate of 5c per gallon. Seal oil remains at the 1922 rate of 6c per gallon. Castor oil is unchanged from the 1922 rate of duty."

The following denaturing instructions are those now promulgated by the Bureau of Customs for the denaturing of olive oil. They are published herewith on the assumption that under the terms of the proposed Tariff Act any denaturant now permitted to be used in connection with olive oil may be employed in denaturing palm kernel, sunflower, sesame and rapeseed oils.

Art. 430. DENATURING.—Olive oil will be admitted free of duty when imported for mechanical or manufacturing purposes if denatured abroad, or while in customs custody after importation, in such manner as to render it unfit for use as food.

Each cask or package of oil claimed to have been denatured before importation must be sampled and tested by the appraiser.

Oils imported for mechanical or manufacturing purposes may be denatured under customs supervision at the request and expense of the importer by one of the following formulas to be selected by the importer:

To 100 gallons of the oil to be denatured add *any* of the following substances:

(a) Three gallons rosin oil, preferably second or third runs. (b) Three gallons refined, destructively distilled wood turpentine, boiling not lower than 160° C. (c) One hundred and fourteen pounds caustic soda. (d) One-fourth gallon pyridin. (e) One-half gallon creosote. (f) Four gallons aniline oil. (g) Six gallons dark-colored oleic acid. (h) Six ounces oleoresin capsicum. (i) Twelve ounces oil rosemary, full strength, to 50 gallons. (j) Not less than 2 per cent of pine tar. (k) One part by volume of sulphuric (66° B.) acid to 99 parts oil, and the mixture allowed to stand at least 24 hours before being released.

Systematic Organic Analysis

Detail of Methods for the Positive Identification of Unknown Organic Compounds[1]

By WILLET F. WHITMORE*

THE chemist is frequently called upon to identify an organic substance. Unless he has had some special training in the methods of organic analysis he is very likely confined to making a few simple chemical tests and basing his conclusions as to the nature of the compound largely on the physical constants of the substance. Even if the substance happens to be a pure compound, any conclusions based almost exclusively on such physical constants as boiling points, melting points, etc. are very likely to be seriously in error. That is to say physical constants without chemical proof will not permit the analyst to answer the question—What is the substance? The proof should be largely chemical.

Kamm, Mulliken and Clarke in this country, Rosenthaler and Staundiger abroad, have been instrumental in collecting data and developing a system of analysis for the identification of an unknown organic substance. While it is still extremely difficult if not impossible to identify the constituents of complex mixtures of organic compounds, it is no longer difficult to identify any single individual provided the compound has been previously prepared and its physical constants determined, and some data of a chemical nature is available. The important thing about an organic compound is its structure, i. e. the manner in which the constituent elements are linked together, hence the problem is not only ascertaining what elements are present in a compound, but determining precisely how these are joined together. If the analyst in his efforts was required to determine constitution by the conventional methods of procedure he would have a very difficult, time-consuming problem every time he started in such an effort. The whole theory and practice in qualitative organic analysis is predicated on the theorem: That a given unknown organic compound is assumed to be identical with a known compound when the two compounds agree absolutely in all of their physical and chemical properties. The basic idea in qualitative organic analysis is to determine to what homologous series a compound belongs and then since the physical constants of the members of an homologous series are different, these may be employed to determine approximately what the substance is. With this information the worker then can consult the literature and will find suggestions for chemical transformations to be applied to the substance, which will give solid derivatives, the physical constants of which will determine exactly the identity of the original substance.

Importance of Homology

THE method of systematic qualitative organic analysis would be impossible if it were not for that very important characteristic of homology. The most practical scheme in the mind of the author for systematic identification of an organic compound is that proposed by Kamm*, and the steps required for the identification of a substance are:

(a) Purification of the compound and determination of its most common physical constants; usually boiling point, melting point, density and occasionally refractive index.

(b) Qualitative analysis for the elements.

(c) Determination of solubility behavior for classification purposes.

(d) Application of class reactions to those types indicated by tests a, b, and c.

(e) Use of the literature on known classes of compounds.

(f) Preparation of derivatives and determination of the physical constants of these derivatives.

The new ideas that these steps present are the classifications scheme and the preparation of derivatives. Classification methods are fairly numerous, but one of the most useful is that making use of the solubility behaviour of the substances in water, in dilute mineral acid, i. e. (HCl), in dilute alkali (NaOH) and cold conc. H_2SO_4. Studies on solubility have brought out some interesting relationships

[1] Presented before the Fall Meeting of The American Oil Chemists Society, New York, November, 1930.

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*Qualitative Organic Analysis—Kamm.

and the ideas so divulged have been utilized to classify organic substances. In organic analysis any substance which is alkali soluble is classified as being acidic but this does not necessarily imply that it gives appreciable H^+ ion concentrations in water solution. In the same way a substance which is acid soluble is characterized as being basic, and here again this does not mean that the substance gives appreciable quantities of OH^- ion in water solution. A substance insoluble in both acid and alkali is considered to be neutral. The application of these ideas and others to systematizing organic analysis can best be perceived by an examination of the table on solubility behavior. By means of this table we can classify a substance into one of the groups appearing in this table, and after it has been placed in a definite group then the next step is to determine to which homologous series within a group the compound belongs.

To illustrate these ideas suppose we were dealing with a substance that falls in the soluble category. This establishes the fact that it is a basic type and may be one of the varieties listed in group III. The next question is to ascertain whether it is a primary, secondary, or tertiary amine. This can be determined in several ways. We may use nitrous acid for the purpose, or benzene sulphonyl chloride. With primary amines water soluble diazonium salts are produced when the amine in cold HCl solution is treated with sodium nitrite solution. Secondary amines give under the same conditions water insoluble nitroso-compounds. Tertiary amines in most cases do not react at all with this reagent. Furthermore acid chlorides and anhydrides in general react with primary and secondary amines, but not with tertiary. The advantage of benzenesulphonyl chloride however, over most acid chlorides is that the compound which it forms with primary amines is soluble in alkalis whereas that produced with the secondary amine is insoluble in alkalis. With these two reagents the reactions are as follows: With nitrous acid

1.° $R^* NH_2 + HNO_2 + HCl \rightarrow RN = N.\ Cl + 2H_2O$ Water soluble

2.° $\begin{matrix} R\diagdown \\ \quad\ NH \\ R\diagup \end{matrix} + HNO_2 \rightarrow \begin{matrix} R\diagdown \\ \quad\ N{-}NO \\ R\diagup \end{matrix}$ (Water insoluble)

3.° $\begin{matrix} R\diagdown \\ R{-}N \\ R\diagup \end{matrix} + HNO_2 \rightarrow$ No reaction except with certain aromatic amines.

With benzenesulphonyl chloride:

1.° amine $R.\ NH_2 + Cl.\ O_2S.C_6H_5 \rightarrow$ $R.\ NH.\ O_2S.\ C_6H_5 + HCl$ Alkali soluble compound

2.° amine $\begin{matrix} R\diagdown \\ \quad\ NH \\ R\diagup \end{matrix} + C_6H_5SO_2Cl \rightarrow$

$\begin{matrix} R\diagdown \\ \quad\ N.\ O_2S\ C_6H_5 \\ R\diagup \end{matrix} + HCl$ Alkali insoluble compound

3.° amine No reaction with the reagent.

Suppose now according to the above we have determined that the compound is an amine. Having established the fact that we have— say a primary— amine we now proceed to an examination of the literature with the information that we have a primary amine with certain definite physical constants. Our search will usually reveal but two or at the most three compounds, which have constants checking or approaching those for the substance being examined, one of which must be the unknown substance.

In the case of an amine it might be suggested to make the acetyl or benzoyl derivative for a primary or secondary amine, and for the tertiary amines either a picrate or a quarternary ammonium salt. The solid derivative of the substance so prepared then is purified by recrystallization and its M.P. determined; if the M. P. corresponds to that given in the literature for the substance so prepared then it is absolutely safe to conclude that the original substance has been identified positively. If, for example, you had one of the three toluidines the constants for which are as follows:

	B.P.	M.P. of the acetyl derivative	M.P. of the Benzoyl derivative
ortho-toluidine	199°C	112°C	142°C
para- "	200°	148°	158°
meta- "	203°	65°	125°

positive identification could be obtained by making either the acetyl or benzoyl derivative, recrystallizing, and then determining the M. P. of this derivative. If there is any doubt as to the identity of a compound following this procedure, more than one derivative can be prepared, and also the method of mixed melting points used. In the latter case some substance of supposedly the same composition is added to the unknown and if the M. P. of the mixture remains constant this can be accepted as proof that the unknown material has the same constitution as the addenda.

Oxygenated Compounds

IN GENERAL the most important commonly occurring organic compounds that we meet with are the so called oxygenated types, which are neutral, i. e. insoluble in dil. HCl and in NaOH and of course insoluble in water when there are more than four carbon atoms present in the molecule. The most important compounds in this category are the alcohols, ethers, aldehydes, ketones and esters. It seems to be generally true that these types are soluble in

*R is used to represent or symbolize an alkyl or aryl group, such as ethyl C_2H_5—, and phenyl C_6H_5— respectively.

cold concentrated sulphuric acid, and most of them can be recovered unchanged from such a solution by pouring the solution into ice water. We can therefore make use of cold concentrated sulphuric acid as a group reagent in assisting us to classify the indifferent compounds of carbon, hydrogen and oxygen; and hence after treatment with dilute acid and dilute alkali we employ this reagent as indicated in the solubility table. In following then the sequence of solubility tests suggested by the table if the unknown substance is soluble in cold conc. sulphuric it may be any one of the types listed in Group V, or it may be a mixed type, i. e. it may possess two or more of the characteristic atomic groupings of this group.

Since the compounds of group V are perhaps of greatest interest to the average chemist, the method of procedure will be indicated for this group. Assume that the solubility behavior indicates an unknown compound in Group V. To determine the homologous series to which the compound belongs in this group, proceed according to the following scheme:

Add to the compound a little phenylhydrazine.

Positive Reaction indicates aldehydes or ketones or some mixed type containing the C=O group.	NEGATIVE TEST Esters (anhydrides), alcohols, ethers, unsaturated HC. Apply the saponification test, i.e. Saponify with 25% aqueous KOH.	
	Positive Reaction Esters and Anhydrides	Negative Reaction. Alcohols, ethers, unsaturated hydrocarboys. Apply the acyl halide test (R. CO. Cl).
	Positive Reaction. Alcohols and other types containing —OH groups.	Negative Reaction. Ethers and unsaturated hydrocarbons. Add Bromine in CCl_4. Decolorization indicates unsaturated hydrocarbon.

Having succeeded by following the above scheme in ascertaining the family to which the unknown substance belongs we next have to locate the member in a given homologous series. This is done in an approximate manner by determining carefully and accurately two or three physical constants (B. P.—M. P.—Density—Refractive Index). Since the members of an homologous series differ in physical properties, the estimation of the above physical constants enables us to approximate what the substance is. There may, for example, be two or three compounds (seldom more) listed in the literature of the homologous series that the determined constants would satisfy or correspond with. Then it becomes necessary to prepare a derivative to settle absolutely the identity of the substance.

To illustrate the procedure in the case of some of the types in this group, suppose that an unknown substance gives a positive reaction with phenyl hydrazine, i. e. it forms a phenyl hydrazone;

$$\begin{matrix} R \\ R \end{matrix}\!\!>\!CO + H_2N.NHC_6H_5 \rightarrow \begin{matrix} R \\ R \end{matrix}\!\!>\!C{=}N.NHC_6H_5 + H_2O$$

and that the tests for aldehyde are negative, i. e. no color with decolorized fuchsine, no reduction of Fehling's solution, and no reduction of ammoniacal silver nitrate solution. This shows the substance is a ketone. Two of the physical constants for the substance are B. P. 104°C. and density 0.830 at 0°C. Seeking information from the literature* on the subject we find that there are two ketones whose constants are very close to those determined for the substance being examined:

1. Diethyl ketone $(C_2H_5)_2$ CO Density 0°C. 0.834 and B.P. 102°C.
   It gives an oxime with M.P. 165°C and a semicarbazone M.P. 139°C.
2. Pinacolone $(CH_3)_3C\!>\!CO$ Density at 10°C. .826 and B.P. 106°C.
   Gives an oxime with M.P. 74°C and a semicarbazone M.P. 157°C.

Since no other ketones have physical constants similar to the compounds being analyzed, the substance, in this case, must be one of these two compounds. Hence to settle the question we prepare either the oxime or the semicarbazone of the substance or both, purify and recrystallize and then determine the melting points of the derivatives. The physical constants on the derivatives will determine definitely the identity of the original substance. The reactions for the preparation of the oxime and semicarbazone of diethyl-ketone are:

$$\begin{matrix} R \\ R \end{matrix}\!\!>\!CO + H_2NOH \rightarrow \begin{matrix} R \\ R \end{matrix}\!\!>\!CNOH \text{ (oxime)}$$

Where R = C_2H_5

$$\begin{matrix} R \\ R \end{matrix}\!\!>\!CO + H_2NOHN\!>\!\begin{matrix} H_2N \\ CO \end{matrix} \rightarrow \begin{matrix} R \\ R \end{matrix}\!\!>\!CN\,NH\!>\!\begin{matrix} H_2N \\ CO \end{matrix}$$

(semicarbazone)

Identification of Esters

SINCE the major constituents of vegetable and animal fats and oils are esters of the trihydric alcohol glycerine, and inasmuch as various esters are being prepared synthetically and used extensively in lacquers, etc. a brief treatment of the procedure in the case of an ester is desirable. In general esters, may produce alcohols and acids which are soluble or insoluble in water and these in turn may be

*Clark, "Handbook of Organic Analysis."
Mulliken, "The Identification of pure organic compounds."
Rosenthaler, "Der Nachweis Organischer Verbindungen."
The original literature may have to be consulted in some cases.

SOLUBILITY TABLE*

Soluble in Water—Groups I & II

I

Soluble in ether

1. Alcohols (low mol. wt.)
2. Aldehydes " "
3. Ketones
4. Acids
5. Other neutral oxygen compounds
6. A few anhydrides
7. A few esters, and amino-phenols
8. Amines (low mol. wt.)
9. Some neutral N comp'ds nitrites, oximes, amides, imides, carbamates

II

Insoluble in ether

1. Polybasic acids, hydroxy acids, etc.
2. Polyhydroxy alcohols, sugars, and certain derivatives
3. Some amides
4. Many sulphonic acids and sulphur compounds
5. Many salts

Insoluble in Water—Groups III, IV & V

Soluble in dilute HCl

III

1. Primary amines
2. Secondary amines
3. Tertiary amines
4. Hydrazine
5. Alkaloids

Soluble in dilute KOH

IV

1. Acids
2. Phenols
3. Some amides, imides, etc.
4. Sulphonamides
5. Primary and 2° nitro comp'ds of the aliphatic series
6. Thio phenols, and sulphonic acids
7. A few enols

Soluble in cold conc. H_2SO_4

Indifferent comp'ds of C, H, & C, H, O

V

1. Alcohols
2. Aldehydes
3. Ketones and quinones
4. Ethers and acetals
5. Esters and lactones
6. Anhydrides
7. Unsaturated hydrocarbons

Insoluble in Water

Insoluble in Water—Groups VI & VII

Insoluble in cold H_2SO_4

VI

Indifferent comp'ds of C, H, & C, H, O

1. Saturated aliphatic hydrocarbons
2. Aromatic hydrocarbons
3. Halogen derivatives of VI_1
4. Halogen derivatives of VI_2

Indifferent compounds containing N and S

VII

1. Nitro comp'ds (tertiary)
2. Amides and negatively substituted amines
3. Nitrites
4. Nitrites, nitrates, azo and hydrazo comp'ds, etc.
5. Sulphones, sulphonyl derivatives of secondary amines
6. Mercaptans, sulphides, sulphates, etc.
7. Miscellaneous

* Qualitative Organic Analysis—*Kamm*

volatile or non-volatile without decomposition. The particular type which one encounters will determine the procedure for the separation of the alcoholic from the acid portion. In the ordinary scheme of procedure the esters are recognized in group V by the fact that they undergo saponification when heated with 20-25% aqueous KOH. Anhydrides also are transformed to the potassium salt of the acid, but in the former case an alcohol is always produced with the K salt of the acid whereas in the latter instance nothing except the potassium salt of the acid is formed. If then a substance has a solubility behavior which places it in Group V and undergoes saponification with 25% KOH, this is fairly conclusive evidence that it is an ester. To illustrate, assume that a compound exhibits this behavior, and that the elementary analysis shows the absence of N, S, and halogens, i. e. an ester of a carboxylic acid. A determination of the physical constants of this substance shows it to have a B.P. of 146°C and a density of .892 at 15°C. Examination of a table of data on esters shows that these constants fit or correspond with the following esters:

	B.P.	Density at 15°C.
ethyl n-valerate	145°	.894
n-butyl propionate	146°	.895
iso-butyl iso-butyrate	147°	.880

To settle the question of identify saponify a sample of the unknown and then distil off the alcohol. This is collected, its physical constants determined and derivatives prepared. If the alcohol so obtained is water-soluble it may be salted out from its aqueous solution by adding K_2CO_3. It is separated from the water layer, dried further if necessary and its physical constants then determined. The physical constants would in many cases be sufficient for the identification of the alcohol, but to make the evidence complete and to provide the chemical proof which is justly required, we make at least one derivative. For

alcohols several substances may be prepared such as:

(a) The phenyl urethanes, which are made by heating equal volumes of phenyl isocyanate and the alcohol according to the following reaction: (taking butyl alcohol as an illustration)

$$C_6H_5NCO + C_4H_9OH \rightarrow CO\begin{matrix}\diagup NHC_6H_5\\ \diagdown OC_4H_9\end{matrix}$$

Phenyl urethanes of Butyl alcohol.

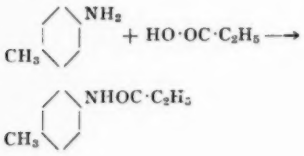
(b) The alpha-napthyl urethanes, where alpha-naphthyl isocyanate is employed.

(c) The benzoates, which are usually prepared by the action of benzoyl chloride on the hydroxy type according to the following:

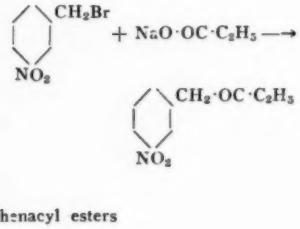
$$C_6H_5CO\,Cl + C_4H_9OH \rightarrow C_6H_5CO.\,OC_4H_9$$

(d) The 1,3,5 dinitro—benzoates which are normally prepared by the action of the acid chloride of 1,3,5 dinitrobenzoic acid on the alcohol in accordance with the equation:
Suppose it was found that the alpha-napthyl urethane and the 1-3-5 dinitro benzoate of the alcohol isolated above had melting points which were respectively 71°C and 64°C. These values correspond to those for the corresponding derivatives of normal butyl alcohol which would seem to confirm the fact that the substance is n-butyl propionate, but in order to make certain of the acid part, we make a derivative of this substance also. Some of the common derivatives for acids and their method of formation are: (taking propionic acid as the example)

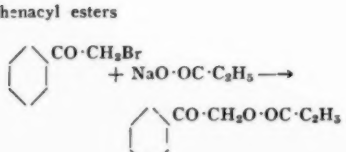
1. The Toluidides



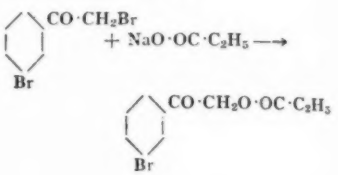
2. The Paranitrobenzyl esters



3. The Phenacyl esters



4. The Para-brom phenacyl esters



In the case of the acid in the above ester if its toluidide melted at 124°C. and its phenylacyl ester at 31°C. the proof for propionic acid would be absolutely complete.

To the uninitiated the suggestion of derivative formation may seem to involve a tremendous amount of work. As a matter of fact, with only a little practice, derivatives can be prepared fairly rapidly and constitute the only proof which is of real significance to the chemist; it is absolutely conclusive. It should be understood that similar methods of characterization such as were illustrated above are available for almost all of the other types listed in the general scheme. In conclusion, it should be pointed out that conclusions based only upon color reactions or colorimetric methods are very hazardous and the more the organic chemist sees of color reactions the less respect he has for them. At the most the evidence which they offer can only be taken as indicative or suggestive and should never be construed as final and complete without some other proof of the nature indicated above.

An investigation of the poisoning effect upon hydrogenation catalysts of various substances has shown that the unsaponifiable matter of cod liver oil causes a marked falling off in the catalyst's activity, while organic phosphorus has little effect. When sulfur in an organic compound is so placed in the molecule as to be in a position to react with the hydrogen, a marked poisoning effect will result. Nitrogeneous material such as isinglass apparently has an effect which is more physical than chemical upon the catalyst. *Chem Trade J.* 84,277-8, 302-3, 351-2, 369-70 (1929). *Chemical Abstracts,* 24,1530 (1930).

By mixing the sulfonic acids of hydrogenated hydrocarbons having several benzene nuclei with oil in the absence of water and allowing them to stand until the product is soluble in water, preparations with the properties of Turkey red oil may be obtained. Ger. Pat. No. 486,840.

Analytical Methods in Summary

Report of Uniform Methods Committee American Oil Chemists' Society, 1929-1930

By J. J. VOLLERTSEN, *Chairman*

Sampling Committee

WE APPROVE the report of the Sampling Committee and recommend that the proposed official sampler be adopted as a tentative alternative sampler for the present official sampling device for a period of one year, with the understanding that the matter will be brought up for definite adoption next year.

We would also urge that as many companies as possible purchase one each of these samplers and advise the Sampling Committee to that effect so that the committee can keep in touch with those using the sampler and thus prepare its recommendations for next year.

Lint on Seed Committee

NO REPORT from the Lint on Seed Committee was submitted to the Uniform Methods Committee.

Detergent Committee

THERE were no recommendations to make with reference to the work of the Detergent Committee inasmuch as they had a change of chairman during the year, which interfered with proper functioning. Their work indicates, however, that they are making progress.

Soap Committee

THE Soap Committe did some very interesting work on the standardizing of normal sulphuric and hydrochloric acid for use in glycerine analysis. Inasmuch as the methods for the determination of glycerine, except in soaps, have not been adopted by the Society the Uniform Methods Committee concurs in the recommendation of the Soap Committee that the international acetin method be adopted for the analysis of glycerine.

Kreis Test Committee

THE Uniform Methods Committee is of the opinion that the comparative analytical work of the Kreis Test Committee was in fair agreement considering the fact that no definite color is specified as the limit between a positive and negative reaction. We would recommend that this Committee be continued and that they attempt to decide upon a limit as determined by color reading, dilution, or some other method, which will indicate definitely when the reaction is positive or negative.

Olive Oil Committee

WE recommend that the report be accepted. Some question has arisen as to the high cost of the necessary instrument for making this test and we recommend that this matter be investigated by the new Committee. We do not recommend the adoption of this method at this time.

Refining Committee

WE recommend the following:

(a) Adoption of tentative refining method for peanut oil, further work to be done by new Committee.

(b) Adoption of tentative refining method for coconut oil, further work to be done by new Committee.

(c) No change in the present F. F. A. test for crude oil.

(d) That further work be done on the color of refined oil as affected by filtering conditions, and in the meantime that changes be made in the refining method, specifying first, that the filter paper used for filtering refined oil must be a high grade white paper; second, that the first 50 cc. of oil through the filter paper must be returned to the filter before collecting the sample for color reading.

(e) Period of agitation in hot bath on oils designated as "slow breaking" oils to be extended to 20 minutes in all cases, with suitable changes in the National Cottonseed Products Association rules to cover this.

Color Committee

THE Color Committee failed to agree on a standard type tintometer, as requested last year, but submitted a report with general

(*Turn to page* 230)

Oil Chemists' Golf Tournament

THE Annual Golf Tournament of the American Oil Chemists' Society, which has become a permanent feature of the Society's Annual Meeting, was held on the course of the Metairie Country Club at New Orleans, Louisiana, on Friday, May 9th. The tournament brought out the best efforts of the golfing chemists in competition for the Nuchar Challenge Cup and for the several other useful prizes which were donated by friends of the Society. The Challenge Cup, which has been donated by the Industrial Chemical Sales Company, is put into competition annually, and is to become the permanent property of any member who succeeds in winning it three times, but not necessarily in successive years. In 1929, the first year it was offered, the cup was won by E. R. Barrow, of Barrow-Agee Laboratories, Memphis, Tennessee. In this year's tournament Mr. Barrow was forced to yield the palm only to his partner, G. Worthen Agee, of the same laboratory. Some of the other members would better polish up their games and break up *that* combination. In addition to the Challenge Cup, the winner of low gross was awarded the Tournament Gold Medal for the year. The medal was donated also by Industrial Chemical Sales Company. The several winners of prizes and their scores were as follows:

LOW GROSS

1st—G. Worthen Agee, Memphis, Tenn.
Cup and Medal
2nd—J. Wrench, New York
Driver and Brassie

LOW NET

1st—C. B. Cluff, Cincinnati, Ohio
Zipper Sports Bag
2nd—W. H. Irwin, Chicago, Illinois
1 doz. Golf Balls

BLIND BOGIE—74

1st—L. B. Forbes, Little Rock, Arkansas	73
2nd—E. R. Barrow, Memphis, Tennessee	77

The blind bogie was determined by drawing a number between 70 and 79 and the prizes awarded to those contestants with the nearest net scores, employing their handicaps as submitted before the play.

The prizes, other than the Challenge Cup and Medal, were donated by the following:

Driver	Darco Sales Corporation
Brassie	Filtrol Company
Golf Bag	Peerless Clay Products Co.
Zipper Bag	Standard Fullers' Earth Co.
2 doz. Golf Balls	Laboratory Construction Co.

Shortening and Oil Prices

Prices of shortening and salad and cooking oils on Thursday, May 29, 1930, based on sales made by member companies of the Shortening and Oil Division of the National Cottonseed Products Association, were as follows:

Shortening

	Per lb.
North and Northeast:	
Carlots, 26,000 lbs.	@11
3,500 lbs. and up	@11¼
Less than 3,500 lbs.	@11¾
Southeast:	
3,500 lbs.	@10¾
Less than 3,500 lbs.	@11¼
Southwest:	
Carlots, 26,000 lbs.	@10¼
10,000 lbs. and up	@10⅞
Less than 10,000 lbs.	@11¼
Pacific Coast:	@11¼

Salad Oil

North and Northeast:	
Carlots, 26,000 lbs.	@10¾
5 bbls. and up	@11¼
1 to 4 bbls.	@11¾
South:	
Carlots, 26,000 lbs.	@10½
Less than carlots	@11¼
Pacific Coast:	@10⅝

Cooking Oil—White

¼c per lb. less than saald oil.

Cooking Oil—Yellow

¼c per lb. less than salad oil.

A report that Unilever, Ltd., was to purchase a controlling interest in the food products division of the Glidden Co. has not been affirmed or denied by Adrian D. Joyce, head of the Glidden Co. A group of Unilever officials have recently completed a survey of all the food and vegetable oil plants of Durkee-Famous Foods, Inc., a subsidiary of Glidden Co. The margarin business of E. F. Drew & Co., New York, was recently absorbed by the Glidden subsidiary.

National Oil Products Co., Harrison, N. J., reported for 1929 a net income of $134,748, or $3.32 a common share after preferred dividends. Comparison with 1928 is not available, but $124,495 was earned in 1927 and $79,747 in 1926.

A. E. Starkie was elected president of Acme Oil Corp., Chicago, at a meeting of the stockholders held April 30. H. Schlosstein was elected vice-president in charge of production.

The whaler, *C. A. Larsen*, which brought back several members of the Byrd Antarctic Expedition to New York, last month, also carried a full cargo of whale oil which it landed at Pier 11, Staten Island. The oil will be delivered to Procter & Gamble Co.

Kreis Test Committee

SIX cooperative samples of corn oil have been distributed and subjected to Kreis Test with results as follows:

Sample No.	Observer 3	4	1	5	2
A	Pos.	Pos.	Pos.	Pos.	Pos.
F	*	Pos.	Pos.	Pos.	Neg. (?)
E	Pos.	Pos.	Pos.	Pos.	Neg.
D	Pos.	Pos.	Pos.	Neg.	Neg.
B	Pos.	Pos. (?)	Neg.	Neg.	Neg.
C	Neg.	*	Neg.	Neg.	Neg.

*Not tested—container broken.

The disagreement is marked, although not quite as extreme as the disagreement on the samples of cottonseed oil described in the previous report (*Oil & Fat Industries, July* 1929, pp. 28-9). It seems probable that the principal difficulty is a difference of opinion as to what constitutes a negative or a positive Kreis Test.

Kerr (*Ind. Eng. Chem. 10,* 471-5, [1918]) has already standardized the Kreis Test to the point that reproducible results can be obtained at the same time in any one laboratory but different laboratories do not obtain consistent results.

The above conclusion is reported without recommendation. The committee was appointed to investigate the value of the Kreis Test as an index of rancidity; to accomplish this task by cooperative effort, it would first be necessary to standardize the Kreis Test in such a manner that scattered observers would report consistent results on the same oil sample. It is left for the Society to determine whether it wishes to undertake such standardization of the Kreis Test and, if so, whether a special committee or one of the standing committees should assume responsibility for carrying on the work. Without such standardization, the positive or negative character of a Kreis Test will depend to a considerable extent upon the laboratory in which the test is made.

A. S. RICHARDSON, *Chairman*

New Books

CATALYTIC PROCESSES IN APPLIED CHEMISTRY
by T. P. HILDITCH

D. Van Nostrand Company, New York, 1929.

A comprehensive survey of the most recent work on catalysis, which describes clearly the processes involving catalytic activity, is this latest work from the prolific pen of Dr. Hilditch, who is Campbell Brown, Professor of Industrial Chemistry in the University of Liverpool. The book is characterized by its use of actual examples from modern industry to illustrate the practical use of catalysts. A clear account of each chemical process involving catalysis accompanies the study of the catalyst and of the reaction itself.

A great number of organic reactions which involve the addition of soluble catalysts to form homogeneous phases with the reaction mixture are described. In this class are included organic oxidations, reductions, polymerizations, hydrations, hydrolyses and condensations. Catalysis at the surfaces of colloidal organic compounds (fermentation processes) is also fully discussed. The theoretical aspects of the various kinds of catalysis are examined judicially.

In summary, we recommend this work without hesitation to all those among our readers who are directly interested in any production operation involving catalysis and to all chemical libraries.

A. P. L.

In separating fats from materials such as whale blubber, fish liver or tallow, the materials are intimately mixed with water-absorbing substances such as burnt gypsum or dessicated alum and the oil extracted from the mixture by solvents or by pressure or centrifugal treatment. The residue may be further extracted with steam. Brit. Pat. No. 314,586.

Methods Committee

(*from page 227*)

recommendations for guidance of the new committee to be appointed. The Uniform Methods Committee think that all of the suggestions should be given careful consideration by the new committee.

Moisture Committee

WE recommend that the Moisture Committee be instructed for the season 1930-31 to collect further data covering moisture determinations on the Smalley Foundation Check Meal samples. We urge the Referee Board require all referee chemists to equip themselves with the official moisture oven.

Fat Analysis Committee

NO report was received from this Committee up to the time of the Annual Meeting.

Cottonseed Analysis Committee

WE approve the report of this committee and recommend that it be adopted as a tentative method for the coming year.

Fat and Oil Data for First Quarter 1930

Production, Consumption, Exports and Imports with Factory and Warehouse Stocks March 31, 1930

WASHINGTON, D. C., May 7, 1930.—The Department of Commerce announces that the factory production of fats and oils (exclusive of refined oil and derivatives) during the three-month period ended March 31, 1930, was as follows: vegetable oils, 799,855,119 pounds; fish oils, 18,762,497 pounds; animal fats, 578,041,618 pounds; and greases, 96,089,270 pounds; a total of 1,492,748,504 pounds. Of the several kinds of fats and oils covered by this inquiry, the greatest production, 500,557,248 pounds appears for cottonseed oil. Next in order is lard with 460,269,236 pounds; linseed oil with 145,969,802 pounds; tallow with 116,511,032 pounds; coconut oil with 90,688,722 pounds, and corn oil with 28,272,262 pounds.

The production of refined oils during the period was as follows: Cottonseed, 449,577,650 pounds; coconut, 76,800,662 pounds; peanut, 3,033,645 pounds; corn, 26,611,404 pounds; soya-bean, 788,506 pounds; and palm-kernel, 3,617,626 pounds. The quantity of crude oil used in the production of each of these refined oils is included in the figures of crude consumed.

The data for the factory production, factory consumption, imports, exports and factory and warehouse stocks of fats and oils and for the raw materials used in the production of vegetable oils for the three-month period appear in the following statements:

PRODUCTION, CONSUMPTION, AND STOCKS OF FATS AND OILS

(In some cases, where products were made by a continuous process, the intermediate products were not reported.)

KIND	Factory operations for the quarter ended March 31, 1930		Factory and Ware'se stocks
	Production (pounds)	Consumption (pounds)	March 31, 1930 (pounds)
VEGETABLE OILS: [1]			
Cottonseed, crude	500,557,248	493,203,812	101,921,509
Cottonseed, refined	449,577,650	287,591,151	535,890,768
Peanut, virgin and crude	12,112,350	4,440,557	1,514,717
Peanut, refined	3,033,645	2,258,184	4,423,037
Coconut, or copra, crude	90,688,722	166,131,337	162,968,464
Coconut, or copra, refined	76,800,662	78,593,942	17,992,922
Corn, crude	28,272,262	35,659,812	8,600,452
Corn, refined	26,611,404	6,296,682	12,355,193
Soya-bean, crude	3,234,985	4,573,833	12,636,912
Soya-bean, refined	788,506	2,049,011	4,053,111
Olive, edible	808,995	320,618	5,527,999
Olive, inedible	—	1,503,612	1,742,512
Sulphur oil, or olive foots	—	9,929,217	12,372,510
Palm-kernel, crude	379,403	12,729,416	20,884,450
Palm-kernel, refined	3,617,626	3,678,337	899,896
Rapeseed	—	3,038,087	6,141,126
Linseed	145,969,802	95,601,333	154,831,899
Chinese wood or tung	—	24,974,543	31,426,002
Chinese vegetable tallow	—	691,316	1,972,516
Castor	15,583,860	5,460,350	13,380,181
Palm	—	49,425,711	46,360,638
All other	2,247,492	4,539,637	17,226,668
FISH OILS: [1]			
Cod and cod-liver	150,737	3,867,296	8,489,715
Menhaden	—	5,574,692	4,289,676
Whale	175,875	18,379,416	25,433,200
Herring, including sardine	18,193,530	16,312,785	80,024,262
Sperm	—	204,030	3,359,645
All other, (including marine animal)	242,355	2,242,029	11,779,526
ANIMAL FATS:			
Lard, neutral	8,782,767	5,625,242	5,115,043
Lard, other edible	451,486,469	3,696,912	87,760,158
Tallow, edible	9,503,746	6,021,458	4,808,308
Tallow, inedible	107,007,286	136,235,018	112,044,241
Neat's-foot oil	1,261,350	1,539,447	1,392,284

[1] The data of oils produced, consumed, and on hand by fish oil producers and fish canners were collected by the Bureau of Fisheries.

PRODUCTION, CONSUMPTION, AND STOCKS OF FATS AND OILS (Continued)

KIND	Factory operations for the quarter ended March 31, 1930 Production (pounds)	Consumption (pounds)	Factory and Ware'se stocks March 31, 1930 (pounds)
GREASES:			
White	19,354,108	10,759,418	11,989,572
Yellow	20,164,173	10,041,067	10,063,601
Brown	10,845,969	15,692,118	12,413,945
Bone	5,853,082	175,040	2,795,969
Tankage	14,509,692	91,080	3,641,163
Garbage or house	20,391,889	17,745,183	17,733,318
Wool	1,631,466	1,372,014	3,692,180
Recovered	552,865	453,736	826,847
All other	2,786,026	873,436	2,621,987
OTHER PRODUCTS:			
Lard compounds and other lard substitutes	279,694,093	44,101	22,949,372
Hydrogenated oils	146,764,562	135,678,282	23,039,937
Stearin, vegetable	4,181,725	3,780,056	2,589,314
Stearin, animal, edible	14,637,149	10,559,097	6,801,434
Stearin, animal, inedible	3,697,091	5,653,036	3,249,816
Oleo oil	28,415,444	10,317,889	9,102,077
Lard oil	3,507,748	3,843,878	4,914,566
Tallow oil	2,580,979	2,211,506	2,246,263
Fatty acids	39,688,944	32,385,151	10,236,488
Fatty acids, distilled	12,109,446	8,136,926	3,049,896
Red oil	8,383,704	6,197,857	6,161,556
Stearic acid	6,517,835	2,284,563	4,899,240
Glycerin, crude 80% basis	35,889,973	36,552,478	14,617,409
Glycerin, dynamite	12,267,135	6,316,921	10,221,071
Glycerin, chemically pure	17,992,868	2,510,887	6,920,710
Cottonseed foots, 50% basis	84,438,153	64,372,443	64,367,352
Cottonseed foots, distilled	24,356,410	20,132,504	5,045,298
Other vegetable oil foots	14,217,230	14,440,932	2,392,037
Other vegetable oil foots, distilled	371,741	1,706,265	1,646,853
Acidulated soap stock	19,325,312	10,771,536	26,601,232
Miscellaneous soap stock	297,203	601,297	347,096

RAW MATERIALS USED IN THE MANUFACTURE OF VEGETABLE OILS

KIND	Tons of 2,000 pounds Consumed January 1 to Mar. 31	On hand March 31	KIND	Tons of 2,000 pounds Consumed January 1 to Mar. 31	On hand March 31
Cottonseed	1,586,059	330,560	Flaxseed	223,036	81,154
Peanuts, hulled	12,938	734	Castor beans	17,392	5,685
Peanuts, in the hull	8,287	398	Mustard seed	74	2,218
Copra	71,573	29,577	Soya-beans	12,844	12,193
Coconuts and skins	700	17	Olives	2,586	—
Corn germs	44,201	195	Other kinds	3,283	2,452

IMPORTS OF OIL SEEDS, QUARTER ENDED MARCH 31, 1930

Cottonseed	44	Poppy seed	642
Castor beans	8,838	Perilla and sesame seed	3,412
Copra	74,601	Other oil seeds	3,541
Flaxseed	184,407		

IMPORTS OF FOREIGN FATS AND OILS, QUARTER ENDED MARCH 31, 1930

KIND	Pounds	KIND	Pounds
Animal oils & fats, edible	86,027	Palm-kernel oil	14,195,010
Whale oil	10,203,502	Sesame oil	6,064,327
Cod oil	4,796,542	Vegetable tallow	631,646
Cod-liver oil	4,963,088	Vegetable wax	568,225
Other fish oils	30,860,182	Carnauba wax	1,796,591
Tallow	283,650	Peanut oil	496,038
Wool grease	2,451,082	Rape (colza) oil	5,465,332
Grease and oils, n.e.s. (value)	$193,770	Linseed oil	1,673,558
Olive oil, edible	21,013,427	Soya-bean oil	3,624,785
Tung oils	31,181,020	Perilla oil	3,219,643
Coconut oil	89,682,672	Other expressed oils	629,776
Sulphur oil or olive foots	13,998,285	Glycerin, crude	1,082,825
Other olive oil, inedible	2,056,711	Glycerin, refined	318,178
Palm oil	52,177,657		

Census Report (*Continued*)

EXPORTS OF FOREIGN FATS AND OILS, QUARTER ENDED MARCH 31, 1930

KIND	Pounds	KIND	Pounds
Animal fats & oils, edible	1,480	Palm & palm-kernel oil	245,107
Fish oils	27,654	Peanut oil	3,888
Other animal oils & fats, inedible	4,338	Soya-bean oil	1,829
Olive oil, edible	25,543	Other expressed oils & fats	174,626
Tung oil	1,462,394	Vegetable wax	235,532
Coconut oil	475,574		

EXPORTS OF DOMESTIC FATS AND OILS, QUARTER ENDED MARCH 31, 1930

KIND	Pounds	KIND	Pounds
Oleo oil	14,680,320	Other animal greases & fats	14,143,653
Oleo stock	1,733,372	Cottonseed oil crude	11,251,443
Tallow	785,599	Cottonseed oil, refined	1,322,444
Lard	205,778,026	Corn oil	93,293
Lard neutral	4,611,321	Vegetable oil lard compounds	1,521,611
Lard compounds, containing animal fats	679,018	Other edible vegetable oils and fats	774,411
Oleo & lard stearin	1,336,374	Coconut oil	5,884,655
Neat's-foot oil	260,546	Linseed oil	438,233
Other animal oils, inedible	147,709	Soya-bean oil	1,155,349
Fish oils	70,227	Vegetable soap stock	4,482,522
Grease stearin	444,137	Other expressed oils and fats, inedible	1,239,796
Oleic acid, or red oil	326,006	Glycerin	115,911
Stearic acid	177,757		

Oil Chemists' Officers

(*from page* 213)

A. S. RICHARDSON

M. M. DURKEE

Mr. Durkee is Superintendent of the Oil Division of the A. E. Staley Manufacturing Company of Decatur, Illinois, manufacturers of cornstarch, corn oil and other products from corn and of soya bean oil, cake and meal. Mr. Durkee was formerly connected with the Pompeian Company of Baltimore, and with the Houck Food Products Company of Kingston, New York.

Mr. Forbes conducts the L. B. Forbes Laboratories of Little Rock, Arkansas, specializing in the analysis of cottonseed oil, meal and other products of the cotton plant.

Mr. Archibald Campbell is well known to all members of the Society, having been active in its councils for many years. After having been Vice-President in charge of manufacturing of the Globe Soap Company of Cincinnati for an extended period, Mr. Campbell sold his interests in that company to the Procter and Gamble Company, and is now engaged in Chemical Engineering Consultation on soap, glycerine and allied products. He is a graduate of the University of Michigan and a Past President of the American Oil Chemists Society. The selection of Mr. Campbell as Vice-President and Chairman of the Soap Section assures that Section of the Society of continued progress during the coming year.

L. B. FORBES

ARCHIBALD CAMPBELL

Prices

Candles, adamantine 6s 16 oz.			
20-set cases	**set.**	**.14½**	**.15¾**
40-set cases	**set.**	**.14**	**.14½**
Candles, paraffin, cs., 14 oz., case of 40 sets	**set.**	**.10**	**.10¼**
6s 14 oz., case of six cartons containing 36 sets	**set.**	**.11**	**.11¼**
6s 12 oz., 40 set cases	**set.**	**.09**	**.09¼**
6s 12 oz. cases of six cartons containing 36 sets	**set.**	**.10**	**.10¼**
Patent ends	**set.**	**.17¾**	**.18**
Stearin 6s 16 oz., plain, cases	**set.**	**.16¾**	**.17**
Castor, No. 1, bbls.	lb.	.12¼	.12½
No. 3, bbls.	lb.	.11¾	.12
Chinawood, bbls. or drs.	lb.	.09¾	.10
Coast, tanks, spot	lb.	.08⅝	.08¾
Futures	lb.	.08¾	—
Coconut, Ceylon grade, bbls.	lb.	.07¾	.08
Coast, Tanks, Domestic White	lb.	.06¼	.06⅜
Cochin grade, bbls.	lb.	.08	.08¼
Manila, bbls.	lb.	.07¾	.08
Tanks, N. Y.	lb.	.06⅝	.06¾
Fatty acids, mill tanks	lb.	.10	nom.
Cod, Newfoundland, bbls.	gal.	.60	.62
Copra, bags, coast	lb.	—	.04
Corn, tanks, mills	lb.	.07¼	.07⅜
Bbls., New York	lb.	.10	nom.
Refined, bbls.	lb.	.11	.11¼
Fatty acids	lb.	.07⅞	nom.
Cottonseed, crude, tanks, mills	lb.	.07¼	—
P. S. Y.	lb.	.08¾	—
Fatty acids, mill, bbls.	lb.	.08⅜	nom.
Degras, domestic, bbls.	lb.	.03¾	.04½
English, bbls.	lb.	.04½	.05
German, bbls.	lb.	.03¼	.03¾
Neutral, domestic, bbls.	lb.	.07¾	.08½
English, bbls.	lb.	.08	.09
German, bbls.	lb.	.07	.07½
Greases, choice white, bbl. N. Y.	lb.	.05¾	.07½
Yellow	lb.	.05⅜	.05½
Brown	lb.	.05¼	.05⅜
House	lb.	.05⅜	.05½
Herring, coast tanks	gal.	—	nom.
Horse, bbls.	lb.	.09½	nom.
Lard, city, tierces	lb.	.10¼	—
Compound, tierces	lb.	.10¾	.11
Middle Western, tierces	lb.	.10⅝	—
Neutral, tierces	lb.	.12	nom.
Prime Western, tierces	lb.	.10¾	—
Lard oil, No. 1, bbls.	lb.	.09¾	—
No. 2, bbls.	lb.	.09½	—
Extra bbls.	lb.	.10¼	—
No. 1, bbls.	lb.	.10	—
Winter strained, bbls.	lb.	.10¾	—
Prime, bbls.	lb.	.12½	—
Linseed Oil, boiled, tanks	lb.	.1360	—
Car lots, bbls.	lb.	.1440	—
Less car lots, bbls.	lb.	.1480	—
Less than 5 bbls.	lb.	—	.1520
Double boiled, less than 5 bbls.	lb.	.1550	.1580
Raw, tanks	lb.	.1220	—
Car lots, bbls.	lb.	.1440	—
Less car lots, bbls.	lb.	.1440	—
Less than 5 bbls.	lb.	.1480	—
Refined, bbls.	lb.	.1470	.1510
Varnish grades, bbls.	lb.	.1490	.1530
Linseed cake, bags	ton	35.00	36.00
Meal, bags	ton	44.00	45.00
Menhaden, crude, tanks, Baltimore	gal.	.45	nom.
Light pressed, bbls.	gal.	.58	.60
Yellow bleached, bbls.	gal.	.60	.62
White bleached, bbls.	gal.	.63	.65
Mustard, bbls.	gal.	.90	—
Neatsfoot, cold pressed, bbls	lb.	.17	—
Extra, bbls.	lb.	.10¼	—
No. 1, bbls.	lb.	.10¼	—
Pure, bbls.	lb.	.12¼	—
Oleo, No. 1, bbls.	lb.	.11⅞	—
No. 2, bbls.	lb.	.10⅝	—
Olive, denatured, bbls. N. Y.	gal.	.75	.85
Shipments	gal.	.75	.80
Foots, bbls.	lb.	.06¾	.07
Shipments	lb.	.06¾	—
Edible, bbls.	lb.	2.00	2.20
Palm, Lagos, casks, spot	lb.	.06⅞	—
Shipments	lb.	.06⅛	—
Niger, casks, spot	lb.	.06½	—
Shipments	lb.	.06	—
Palm Kernel, pkgs.	lb.	.07½	.07¾
Tank cars	lb.	.07	.07¼
Peanut, crude, bbls.	lb.	.09¼	.09¾
Mills, tanks	lb.	.07¾	.08
Refined, bbls.	lb.	.11¾	.nom.
Perilla, bbl.	lb.	.12½	.13
Poppy Seed, bbls.	gal.	1.70	—
Rapeseed, blown, bbls.	gal.	.92	.93
Refined, bbls.	lb.	.67	.70
Red Oil, distilled, bbls.	lb.	.10⅛	.10⅝
Tanks	lb.	.09¼	—
Saponified, bbls.	lb.	.10⅛	.10⅝
Tanks	lb.	.09¼	—
Salmon, coast, tanks	**gal.**	**.35**	**nom.**
Sardine, coast, tanks	gal.	.35	nom.
Sesame, refined, drums	lb.	.12	.12½
Soya Bean, blown, bbls.	lb.	.13	.13½
Crude, bbls.	lb.	.11	.11¼
Orient, coast, bbls.	lb.	.09½	.09¾
Sperm, bleached f.o.b., New Bedford, bbls.	gal.	.84	.85
Natural, f.o.b., New Bedford, bbls.	gal.	.78	.80
Stearic Acid, Double pressed, bags	lb.	.14½	.15
Triple pressed, bags	lb.	.16½	.17
Stearine oleo, bbls.	lb.	.08⅝	.08¾
Tallow, edible, bbls.	lb.	.06⅞	.07⅛
City, extra, works, loose	lb.	.06	—
Special, works, loose	lb.	.05¾	—
Tallow, oil, acidless, bbls.	lb.	.09¾	—
Tanks, N. Y	lb.	.09½	—
Vegetable tallow, coast, mats	lb.	.06¾	—
Whale, crude, No. 1, coast, tanks	**lb.**	**.07**	—
No. 2, coast, tanks	lb.	.06½	—
Refined, winter bleached, bbls.	gal.	.80	—
Extra, bbls.	gal.	.82	—
Natural, bbls.	gal.	.78	—

Market Report on

FATS, OILS AND GREASES

(*As of May 28, 1930*)

NEW YORK—After a flurry of increased activity and advancing prices last period, the market for oils, fats and greases again resumed what has come to be considered its usual downward trend during the period recently concluded. Price changes were numerous, and with only one exception these represented revisions to lower levels. Demand of an important nature did not assert itself at any time during the period, and only the lack of increased offerings on the part of sellers kept the market from going lower. The market was quiet with few sales being recorded, and these for the most part were only for small lots. Coconut oil was slightly easier both in local and coast markets, although the tone in primary markets was slightly more optimistic. Fewer offerings are now being made by importers and refiners. Chinawood oil declined all during the period, following the silver and Chinese exchanges in their downward trend. Crude corn oil was also easier at the close. There was little activity in the cottonseed oil market, and prices did not change appreciably during the period. Renewed competition on the greases was again responsible for reduced quotations on these products. Tallow also declined as buyers showed little interest in the market. Other small declines were noted in palm oil, oleo oil, soya bean oil, lard oil and stearine.

Chinawood Oil

Chinawood oil was quoted at 9¾c lb. in bbls. at the close, this representing a decline of a full cent under quotations prevailing a month ago. New low levels were registered in Chinese and silver exchange during the period, this being one of the important factors in the chinawood oil decline.

Coconut Oil

As the technical situation in the London market which was responsible for price advances in coconut oil last period adjusted itself, quotations on this oil dropped again to previous levels in the domestic market. An inside price of 7¾c lb. was noted on barreled Manila oil, but sellers were not particularly anxious to make further offerings at this level in view of stronger sentiment in the Manila market.

Corn Oil

A lack of appreciable demand for corn oil sent quotations down again after a short rally last period. Mill tanks were offered at 7¼c lb., inside, as the period closed, but there were few offers at this level.

Cottonseed Oil

The cottonseed oil market was quiet all during the period with sales in small volume and prices relatively stable. Both buyers and sellers seemed content to remain inactive awaiting further developments in the situation. Closing prices were 7¼c lb. on crude and 8¾c lb. on P. S. Y.

Grease

After being stabilized for a short time last period greases again resumed their downward trend, and new lows for the past year were set during the recent period when yellow and house grease sold at 5⅜c lb., inside. Renewed competition among sellers coupled with lack of interest on part of buyers was responsible for the decline.

Lard

Lard held up fairly well in the general decline of the recently concluded period and at the close was only ¼c lb. under the quotations of last period on city tierces. Middle Western and prime Western were down only ⅛c lb., while compound and neutral lard were unchanged. Demand held up fairly well and supplies were not particularly plentiful.

Tallow

Tallow declined early in the period as additional offerings were made by producers at concessions. After this drop the market held quiet and steady through the rest of the period, with city extra closing at 6c lb.

OIL & FAT INDUSTRIES

The Editor's Page

The Situation in Europe—and Here

IN THIS issue, we are privileged to publish a summary of the European oil and fat consumption for the first three months of 1930, as reflected by the imports and exports of the principal countries. The outstanding fact shown by the figures is the substitution of whale oil and other fish oils for an important proportion of the leading vegetable oils of European commerce. Next in interest is the apparent condition of actual decline in quantity of the total amount of oils and fats of all kinds consumed by the major European markets.

There can be but one interpretation of such a situation: that there has been a definite decrease in the buying power of the public in those countries which have been so affected. Fat of some kind is an essential part of all diets, and a decrease in the consumption of fats undoubtedly indicates a tightening of the collective purse strings of the buying public.

The inevitable result of decreased European buying is promptly reflected in lower oil and fat prices in this country, which may be verified at the present time by a glance at the market report, showing lower prices for all grades of fats than have been current at any time since the beginning of the recent World War.

Wherein lies the reason? In a place not generally suspected, in our opinion. An analysis of the figures of oils and oil-bearing materials imported for domestic consumption in the various European countries will show that the decline has been most marked in England, Holland and France, and that Germany has shown, on the other hand, a substantial increase in imports available for domestic consumption. A study of the figures of whale oil production and consumption will show immediately that there has been a large net import and production of whale oil in the United Kingdom, in Holland and in Germany. France, on the other hand, has not materially increased her whale oil importation or production, but has benefited by a bumper olive crop, which has enabled her to reduce her imports of oils and oil-bearing seeds.

It is apparent, therefore, that England and Holland have substituted whale oil and other fish oils for a portion of the vegetable oils which enter into their respective economies, that the consumption of all classes of fats, including the marine fats, is steadily increasing in Germany, and that France is conservatively remaining true to the higher grades of vegetable oils. These conditions have combined to lower world prices of oils and fats at the present time, but it is in order for American consumers to pay strict attention to the progress of Antarctic whaling, for any sudden failure of the whale catch will be followed closely by a marked advance in oil and fat prices.

Junk!

ACCORDING to an engineer well versed in modern plant practice, there is too much machinery and equipment still doing duty in oil and fat refineries, which should long ago have been consigned to the junk pile. Boilers, tanks, kettles, mills, piping, packaging equipment, dryers, and other machinery were mentioned by name. One instance was particularly pointed out, the case of a compound plant, the owners of which had steadfastly refused year after year to put in two much-needed boilers to replace two which had long since outlived their usefulness. They took it out in patching up the old wrecks, until not so long ago, within a few days of each other, the two old-timers gasped their last and refused to make steam any longer. The several weeks delay in replacing them at a time when they were most needed, cost a great deal more in dollars, time, and delayed production than the entire cost of the equipment if it had been put in when first needed.

Break-downs from patched up machinery and equipment are all too common. And it seems that these break-downs always come at

a time when they can least be afforded. That it is shortsighted policy to save one dollar this year and spend out two next year for the same thing, goes without saying. Yet there are hundreds of plant owners who do it year in and year out. Those who would not bet a nickel at a thousand to one on a broken down plug in the Kentucky Derby, will gamble the efficiency of their plants on a lot of patched up machinery. And, the odds are a hundred to one against them in modern competition.

In this American oil industry of ours, we are told that there is still enough junk operating to be melted up and make a couple of first rate battleships. Be that as it may, experience proves that the cost of de-junking a plant does not come as high in the long run as keeping the junk running, with the ever-present attendance of faithful mechanics, until it emits its last gasp.

Soybean Oil Association

The National Soybean Oil Manufacturers' Association was organized in Chicago, May 21, at a meeting of representatives of crushers of soybeans, distributors of soybean oil, handlers of soybeans, and agricultural departments of universities in the Middle West. The new association will embrace as active members manufacturers and refiners of soybean oil. Associate memberships will be offered to others interested in the projects of the organization.

The officers of the new association are:—President, Otto Eisenschiml, of the Scientific Oil Compounding Company, Chicago; vice-presidents, W. L. Shellabarger, of the Shellabarger Grain Products Company, and R. G. Dahlberg, of the Armstrong Paint & Varnish Works; secretary, Whitney Eastman, of the William O. Goodrich Company, Milwaukee; treasurer, I. C. Bradley, of the Funk Brothers Seed Company. Other directors are H. G. Atwood, of the Allied Mills, Inc.; Robert Bennet, of Spencer Kellogg & Sons; Edward Evans, W. E. Flumerfelt, of the Central States Chemical Company; David Lewis, of Falk & Co.; E. K. Scheiter, of the A. E. Staley Manufacturing Company, and B. C. Williams.

Whitney Eastman, chairman of the organization committee, reported an outline of the purposes of the association. These include stimulation of production and consumption of domestic soybean oil, formulation of equitable trading rules, and establishment of the industry on a firm basis of ethics. Harry S. Haze, of Harry Haze, Inc., presented a tentative set of trading rules. These were discussed at length and adopted after a few minor changes had been made.

Glenn H. Pickard, for the technical committee, presented tentative specifications for soybean oil. These were adopted, and a permanent technical committee will be maintained. At the suggestion of Prof. Roger Adams, of the University of Illinois, a research committee was created for the purpose of developing new uses for soybean oil. Mr. Pickard will be chairman of this committee.

Unilever, Ltd., Reports

With the accounts of Unilever, Ltd., (formerly Margarine Union) for 1929, just issued, are combined those of Unilever, N. V., of Rotterdam, and a consolidated balance sheet and profit and loss account of the two companies. These are the two chief holding companies of the recent merger, and in order to give stockholders a clearer view of the financial structure of the organization a summary has been provided of the balance sheets of the five chief "sub-centers" of the organization — namely, Van den Berghs, Anton Jurgens' Vereenigde Fabrieken, N. V. Van den Bergh's Fabrieken, Jurgens, Ltd., and N. V. Hovema.

The combined profits of the two chief holding companies were £3,524,784 against £1,666,849 in 1928. Due to the great increase in the capital account arising from the acquisition of further businesses during the year, the dividend, though again at the rate of 10 per cent, requires £1,578,858, against £902,960 in 1928.

The accounts for 1929 of Lever Bros., Ltd., (the absorption into Unilever, Ltd., did not become operative until January 1, 1930) show that the net profit amounted to £6,213,505, an increase of nearly £1,000,000 over the 1928 figure of £5,274,075. Of the company's issued share capital of £56,627,546, all but £2,400,000 in ordinary shares is in the form of preference and preferred ordinary shares carrying fixed rates of dividend. These fixed dividends again absorb £4,895,534, while a dividend of 10 percent is to be paid on the ordinary shares, compared with 5 percent in 1928, requiring £240,000.

European Oil Imports Decline 9,000 Tons

Net Available in Most Important Countries Materially Lower During First Quarter 1931 Than a Year Ago.

THROUGH the Foodstuffs Division of the Department of Commerce, *Oil & Fat Industries* is enabled to offer its readers comprehensive figures on the oil and oilseeds trade of the major countries overseas.

It is believed that this feature will prove of great interest and benefit to the majority of our readers, and if the feature meets with their approval, it is planned to publish a quarterly resumé of these figures.

Every producer and consumer of oil and fat products must realize the inescapable effects upon his business of world conditions in the fatty oil trade, particularly in these days when the progress of invention and discovery makes the various oils and fats more and more interchangeable for almost any useful purpose. The development of hydrogenation, improvement of refining and bleaching processes, new economies in the application of destearinization, the production of glycerine from sugar by fermentation methods, advances in the arts of oil extraction, oil blowing, fatty acid distillation, and sulfonation, all affect the demand in certain quarters for certain oils, and thus inevitably react upon worldwide markets for all fatty oils.

In this initial compilation we shall not endeavor to supply detailed figures covering the imports and exports of the various countries of Europe during the year 1929, but shall direct our readers' notice particularly to some of the outstanding characteristics of the world's trade and the important changes in trend from the experiences of former years.

Of paramount importance is the rapid growth of the consumption of whale oil and other fish oils in Continental countries, where hydrogenation has been utilized to make this class of oils available for edible purposes. In Germany for example, the imports of whale oil and other fish oils in 1929 exceeded those of 1928 by 20,471 long tons and those of 1927 by 39,910 long tons. (Ed. Note: Wherever the word ton is used below it will indicate a long ton of 2240 pounds.) Holland, likewise, showed a great increase of imports of whale and fish oils in 1929 over each of the two previous years, the 1929 excess over 1928 being 32,599 tons and over 1927, 31,587 tons. The exports of hardened fish oils from both these countries also showed great gains in 1929.

France, on the other hand has not taken so kindly to the consumption of the fish oils, her imports of whale oil having increased only slightly in 1929, while those of other fish oils fell off slightly as compared with 1928 and 1927. The oil of greatest popularity in France at present seems to be peanut oil, imports of which, as represented chiefly by importation of the nut itself, increased in 1929 by approximately 20,000 tons (total oil plus oil equivalent of seeds imported) over 1928 and 50,000 tons over 1927. It is of interest to note that France is predominantly an oil-producing country, her imports of all fatty oils in 1929 being less than one-fourth of her imports of oil-bearing seeds expressed in their oil equivalent. French exports of oils, except of olive and peanut oils, are comparatively negligible, indicating that the French nation consumes most of the fatty oils produced in the country, from domestic and imported oil-bearing materials.

The United Kingdom of Great Britain and Ireland imported in 1929 8,000 tons more whale and fish oil than in 1928 and 18,000 tons more than in 1927.

The figures for the first quarter of 1930 show a similarly increasing trend in the imports of whale and fish oils for all of these countries during the quarter.

In line with these increases in the European consumption of whale and fish oils there has been an even greater decrease in the available imports of the chief competing oils (as oils or seeds) available for domestic consumption in those countries. This is shown most clearly and concisely by the following table, from which it will be seen that the total imports available for domestic consumption of the seven leading oils and their corresponding oil-

seeds in Germany, the United Kingdom, Holland and France declined about 31,000 tons in the first quarter of 1930 as compared with the corresponding period in 1929. The total increase in the net available imports of fish oils and whale oil for the same comparison periods and countries was 22,000 tons, which indicates displacement of the other oils by fish and whale oils in European oil and fat economy to the extent of approximately 85,000 tons or 190,000,000 pounds annually, considering only the four leading countries. The net decrease in imports available for domestic consumption of all the important oils and fats would thus appear to be about 9,000 tons, or 20,000,000 pounds for the four leading European countries, for the first quarter of 1930, as against the same quarter of the previous year.

Statement Showing Comparative Figures of Net Available Imports of Various Oils in Certain European Countries

3 Months Ending March 31st, 1930 with Comparisons for 1929.

	GERMANY		UNITED KINGDOM		HOLLAND		FRANCE		TOTAL FOUR COUNTRIES	
	1930 Tons	1929 Tons	1930 Tons	1929 Tons	1930 Tons	1929 Tons	1930 Tons	1929 Tons	1930 Tons	1929 Tons
COPRA										
Oil Equivalent Seed Imported	29,182	34,554	13,512	15,785	19,122	20,599	24,818	28,561	86,634	100,499
Oil Imports	2,227	2,997	9,981	15,518	1,586	904	1,471	901	15,265	20,320
	31,409	37,551	23,493	32,303	20,708	21,503	26,289	29,462	101,899	120,819
Less Oil Equivalent Seed Exported	—	—	3,453	5,173	51	227	5	53	3,509	5,453
Less Oil Exports	4,558	4,836	1,019	1,567	10,999	12,609	2,984	4,174	19,550	23,186
NET AVAILABLE	26,851	32,715	19,021	25,563	9,658	8,667	23,300	25,235	78,830	92,180
PALM KERNELS										
Oil Equivalent Seed Imported	34,327	24,158	9,851	21,705	1,764	160	1,355	914	47,297	46,937
Oil Imports	415	178	735	90	235	36	340	155	1,725	459
	34,742	24,336	10,586	21,795	1,999	196	1,695	1,059	49,022	47,396
Less Oil Equivalent Seed Exported	—	—	—	61	6	—	18	—	24	61
Less Oil Exports	11,083	9,719	4,434	4,218	1,082	156	512	431	17,111	14,524
NET AVAILABLE	23,659	14,617	6,152	17,516	911	40	1,165	638	31,887	32,811
PEANUTS										
Oil Equivalent Seed Imported	83,572	69,869	14,336	15,807	13,793	12,595	55,263	59,995	166,964	158,266
Oil Imports	376	335	—	—	5,901	6,845	1,408	1,346	7,685	8,526
	83,948	70,204	14,336	15,807	19,694	19,440	56,671	61,341	174,649	166,792
Less Oil Equivalent Seed Exported	—	—	84	117	140	53	364	784	588	954
Less Oil Exports	17,887	12,285	—	—	4,255	3,553	8,859	9,524	31,001	25,362
NET AVAILABLE	66,061	57,919	15,252	15,690	15,299	15,384	47,448	51,033	143,060	140,476
SOYA BEANS										
Oil Equivalent Seed Imported	45,939	32,697	8,047	14,132	1,910	1,038	3	79	55,899	47,946
Oil Imports	1,384	13	5,435	993	14,466	6,524	3,214	1,273	24,499	8,803
	47,323	32,710	13,482	15,125	15,376	7,562	3,217	1,352	80,398	56,749
Less Oil Equivalent Seed Exported	—	—	—	324	2	7	—	—	2	331
Less Oil Exports	7,914	9,988	3,826	4,790	2,519	1,952	—	72	14,259	16,802
NET AVAILABLE	39,409	22,722	9,656	10,011	13,855	5,603	3,217	1,280	66,137	39,616
RAPE SEED										
Oil Equivalent eed Imported	429	1,111	425	2,432	277	572	697	1,252	1,828	5,367
Oil Imports	430	104	1,831	382	48	68	—	1	2,309	555
	859	1,215	2,256	2,814	325	640	697	1,253	4,137	5,922
Less Oil Equivalent Seed Exported	88	81	14	6	141	193	34	43	277	323
Less Oil Exports	70	126	2,122	1,753	28	172	51	103	2,271	2,154
NET AVAILABLE	701	1,008	120	1,055	156	275	612	1,107	1,589	3,445
COTTONSEED										
Oil Equivalent Seed Imported	13	1,291	27,860	29,220	—	—	—	694	27,873	31,205
Oil Imports	1,472	1,363	3,981	1,908	115	1,678	978	1,241	6,545	6,190
	1,485	2,654	31,841	31,128	115	1,678	978	1,935	34,419	37,395
Less Oil Equivalent Seed Exported	—	—	—	—	—	—	9	—	9	—
Less Oil Exports	—	—	5,704	6,316	31	607	15	1	5,750	6,924
NET AVAILABLE	1,485	2,554	26,137	24,812	84	1,071	954	1,934	28,660	30,471
LINSEED										
Oil Equivalent Seed Imported	19,446	27,360	14,774	29,196	17,048	32,390	9,712	15,254	60,980	104,200
Oil Imports	3,982	1,502	14,637	5,040	1	165	200	599	18,820	8,306
	23,428	28,862	29,411	35,236	17,049	32,555	9,912	15,853	79,800	112,506
Less Oil Equivalent Seed Exported	87	116	46	47	985	821	65	55	1,183	1,039
Less Oil Exports	839	678	4,179	4,898	21,929	13,678	2,201	613	29,148	19,867
NET AVAILABLE	22,502	28,068	25,186	30,291	x5,865	18,056	7,646	15,185	49,469	91,600
NET AVAILABLE ALL OILS	180,668	159,703	100,524	124,938	34,098	49,545	84,342	96,412	399,632	430,599
Net available decrease										30,967

x Balance of Exports over Imports.

American Oil Chemists' Society

Summary of Treasurer's Annual Report 1929-1930

RECEIPTS:		
Balance May 1, 1929		$2765.85
Interest received		455.56
Referee Chemist Fees		175.00
Dues and Subscriptions		1903.42
Sales of Chemicals, etc.		2143.36
Convention Registration Fees		495.50
Sales of Analytical Methods		575.34
TOTAL		$8514.03
DISBURSEMENTS:		
Bonds Purchased		$2033.33
Secretary's Salary and Office Expenses		777.88
Advertising and Printing		390.15
Subscriptions to Journal		414.72
Referee Board Expense		12.36
Chemical Sales, etc., Expense		1724.84
Conventions Expense		449.14
Analytical Methods Expense		275.93
Salaries of Research Chemists for Refining Research		502.60
TOTAL		$6580.95
Cash Balance April 30, 1930		$1933.08
PROFIT AND LOSS, 1929-1930		
Balance May 1, 1929	$2765.85	
Receipts	5748.18	
TOTAL	$8514.03	
Disbursements, except bond purchase	4547.62	
Balance April 30, 1930	$3966.41	
Increase in Assets for the year		$1200.56
BALANCE SHEET AS OF APRIL 30, 1930		
Assets:		
Cash in bank and on hand		$1933.08
Bonds:		
Liberty Bonds		200.00
Chicago Medical Arts Bldg.		1500.00
National Union Mortgage Bonds		2000.00
Acct. Receivable		74.12
TOTAL		$5707.20
Supplies and materials on hand—Nominal		
Liabilities:		
Account payable		$37.95
NET ASSETS AS OF APRIL 30, 1930		$5669.25

J. C. P. Helm, *Treasurer.*

A Useful Constant for Oil Identification

The Use of the Kaufmann Thiocyanogen Value in The Analysis of Fats and Oils[1]

By A. D. BARBOUR*

IT HAS been known for a long time that certain organic and inorganic radicals have the properties of elements. The most familiar example is probably the ammonium group (NH_4) which acts as though it were an alkali metal. Nearly 100 years ago, Berzelius, as the result of a study of the salts of thiocyanic acid, predicted that if the radical thiocyanogen (SCN) could ever be isolated in the free state, it would be found to have many of the properties of a halogen.

Several unsuccessful attempts were made to prepare this substance, but it was not until about 15 years ago that the Danish chemist Bjerrum succeeded in demonstrating the presence of free thiocyanogen in the mixture of decompostion products of gold thiocyanate in aqueous solution. He found the substance to be very unstable, in aqueous solution rapidly undergoing hydrolysis with the formation of thiocyanic, hydrocyanic and sulphuric acids.

In 1919, Söderbäck isolated thiocyanogen in pure form, and published an extensive study of its properties and reactions. The substance was prepared by the action of bromine on silver or lead thiocyanate suspended in ether or other organic solvents. The properties of thiocyanogen strikingly verify the prediction of Berzelius. It liberates iodine from iodides, dissolves metals, even gold, with the formation of thiocyanate: is a powerful oxidizing agent and generally possesses all the characteristics of a halogen intermediate in chemical activity between bromine and iodine. Kaufmann, in 1921, was attracted to thiocyanogen by the need for a halogen reagent which would react less strongly than bromine but more strongly than iodine. His success with the reagent in other organic researches suggested the possibility of using it in fat analysis as a means of differentiating the various unsaturated fatty acids.

A careful investigation of the action of thiocyanogen on saturated and unsaturated acids showed the following results.

Saturated acids, would be expected, do not react.

Oleic acid adds thiocyanogen in the same proportion as iodine: i.e. molecule for molecule.

Linolic acid adds thiocyanogen to only *one* of its two double bonds, while iodine is added to both. Thus linolic acid has an iodine number of approximately 180, while its "Kaufmann number" is only 90, the same as for oleic acid.

Stearolic acid, with a triple bond, does not add thiocyanogen.

Analytical Use

THE peculiar behavior of linolic acid at once suggested the possibility of using this value in the analysis of such fats as lard, tallow, cottonseed or peanut oil etc. containing no acids less saturated than linolic. The departure of the thiocyanogen number from 90 gives a measure of the saturated acid fraction, while the difference between the iodine and Kaufmann number gives the linolic acid content.

Recently, Kaufmann and Keller have extended the method to the estimation of the linolenic acid in drying oils. Linolic acid adds thiocyanogen to two of its three double bonds, and if the saturated acid content is separately estimated by the Twitchell or Bertram methods, the linolenic acid content can be calculated from the iodine and thiocyanogen numbers.

The estimation of the Kaufmann numbers is very easily carried out. The reagent is prepared by suspending dry lead thiocyanate in anhydrous acetic acid, decomposing with dry bromine, and filtering. Lead thiocyanate is easily prepared in the laboratory from lead acetate and postassium thio-

[1] Presented at Twenty-first Annual Meeting, American Oil Chemists' Society, New Orleans, May, 1928.
* Ontario Research Foundation.

cyanate: anhydrous acetic acid is made by refluxing C. P. glacial acetic acid with a slight excess of acetic anhydride. Kaufmann recommends N/10 solutions; we have found it convenient to use N/5, since larger fat samples can be used and greater accuracy obtained. All the reagents and apparatus used, including the fat sample, must be thoroughly dry. The solution is stable for about one week. The technique of the determination is identical with that for the Wijs iodine number estimation. A solvent for the fat or fatty acid is unnecessary. The reaction is slower than the absorption of iodine, but is complete on standing over night. The thiocyanogen absorption is expressed in terms of iodine.

Comparative Analyses

IN ORDER to investigate the possibility of using this method for plant control of hydrogenation, we undertook the analysis of two series of samples of cottonseed oil drawn at various stages in the hydrogenation process. The samples were analysed by the Kaufmann method and also by the Twitchell lead salt-alcohol method. The results of the first series are shown in table 1.

TABLE I

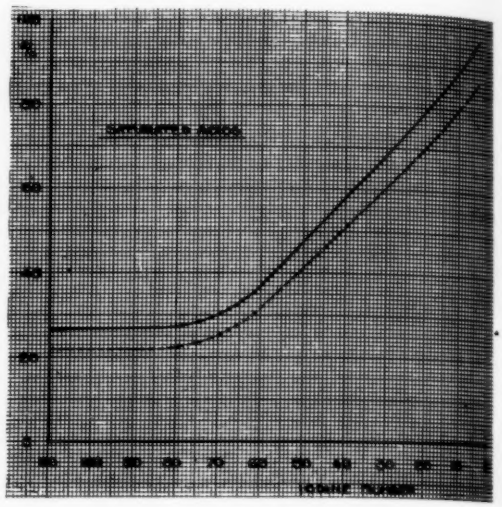
Sample No.:	Iodine Number	Kaufmann Number	Saturated acids %	Linolic acid %
1	107.2	65.6	27.1(22.6)	46.2(41.7)
2	97.2	65.9	26.8(22.8)	34.8(28.8)
3	91.0	65.2	27.6(22.1)	28.7(20.8)
4	84.0	65.9	26.8(24.9)	20.1(16.0)
5	79.7	65.9	26.8(25.4)	15.3(11.7)
6	75.8	66.2	26.5(26.6)	10.6(7.9)
7	75.6	66.3	26.4(26.0)	10.2(7.7)

The second series is more extensive, the hydrogenation being carried to completion. These results are shown in table II.

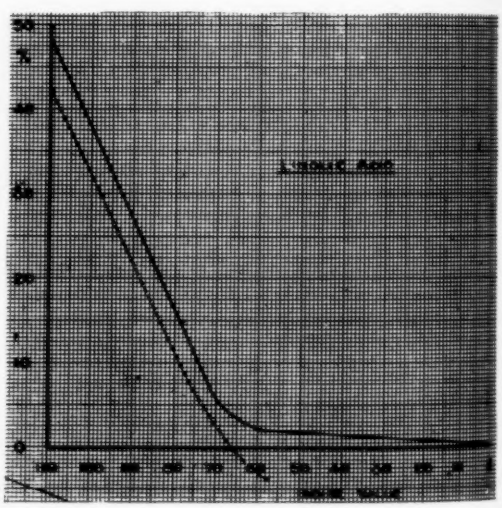
TABLE II

Sample No.:	Iodine Number	Kaufmann Number	Saturated acids %	Linolic acid %
1	109.4	66.2	26.4(21.2)	48.0(42.1)
2	94.1	65.4	27.4(22.1)	31.9(26.2)
3	92.9	65.8	26.9(22.4)	30.1(25.3)
4	87.9	65.1	27.7(21.5)	25.3(20.3)
5	83.3	64.7	28.1(22.4)	20.7(14.6)
6	79.2	64.2	28.7(22.7)	16.1(10.4)
7	77.4	64.0	28.9(23.7)	14.9(10.2)
8	73.8	64.7	28.1(23.9)	10.1(5.8)
9	70.2	65.0	27.8(25.8)	5.8(4.4)
10	59.5	57.9	35.6(32.7)	1.8(neg. val.)
11	39.8	38.1	57.7(47.3)	1.9 " "
12	20.0	18.6	79.4(72.6)	1.6 " "
13	3.5	3.2	96.5(86.8)	0.0 " "

The first curve shows the saturated acid values found by the two methods. The second curve shows the linolic acid by the two methods, and the third curve the residual oleic and iso-oleic acid. It was established before the investigation was started that iso-oleic acid behaves exactly like oleic acid with the Kaufmann reagent, and thus the presence and concentration of iso-oleic acid does not affect the determination.

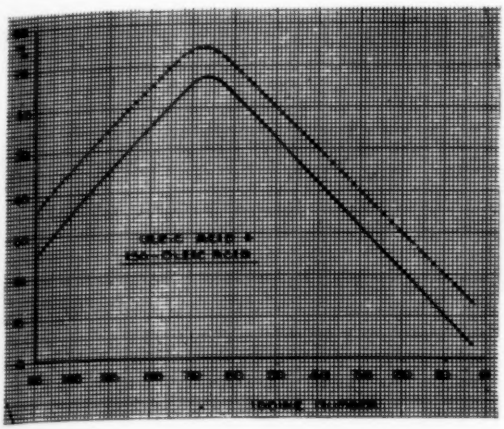


Curve I

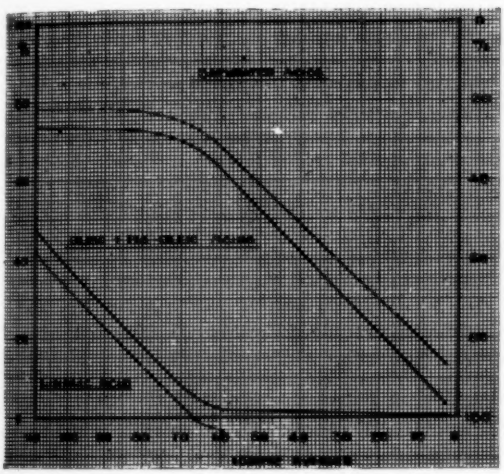


Curve II

The fourth curve shows a composite diagram from all these curves, showing the



composition of the product for each iodine number.



It is readily seen that a discrepancy of about 4% exists in both the linolic and saturated acid values by the two methods. However, the great convenience and rapidity of the Kaufmann value would recommend it as a plant control procedure, and if desired, the results may be made comparable with those from the Twitchell method by the subtraction of an appropriate correction. However, it is our opinion that the Kaufmann number determination probably gives the more nearly absolute results of the two methods. From table II it is readily seen that, in the last four samples at least, the saturated acid content found by the Twitchell method is too low for a product of the given iodine number, and if the linolic acid values are calculated from the Twitchell figures, impossible negative values are obtained. Thus in these samples at least, and probably in all the others, the Kaufmann value is the more absolute.

A further point to be noted in both the series is that there is practically no change in the Kaufmann number until the iodine number has been reduced to about 70 or 80, i.e. to the stage of a partially hydrogenated shortening. It follows from this fact that if the Kaufmann value of a batch of oil be determined once and for all, the linolic acid content of all the shortening batches made from this batch of oil can be calculated from the iodine value alone.

It is our opinion, therefore, that the Kaufmann value forms a very convenient index in the analysis of oils and fats, and gives values which are at least as accurate as those obtainable from the Twitchell method.

Niger Co., a subsidiary of Lever Bros., intends to exercise its option to repay the present outstanding £1,500,000 7% debenture stock issued in 1925. The stock is repayable on or after October 1, 1931 at 103% and the company proposes to repay the full amount on that date. Bulk of money needed for this procedure will be gotten by issue of 5% stock, carrying an unconditional guarantee of Lever Bros.

Turbo-Mixer Corp., New York, has leased additional space in the Crystal Building, 250 W. 43rd St., where the general offices, testing and research laboratories will now be consolidated. All manufacturing has been concentrated in one plant at Hudson, N. Y.

Henley's Twentieth Century Home & Workshop Formulas, Recipes and Processes.

800 pages, 6 x 9. Bound in cloth. Published by Norman W. Henley Publishing Co. 1930 edition. This volume in its most recent edition contains more than 10,000 formulas and recipes, covering almost every industry. Among these are included 10 pages of formulas for various kinds of soaps and 10 pages of formulas on polishes. It is a very useful book to have about the laboratory or plant as its scope is wide, and a formula is given for almost any product which one might want to make.

Solvent Extractions— The New and Better Way

Presented Before the Twenty-first Annual Convention of The American Oil Chemists' Society, May, 1930

By David Wesson

David Wesson

WHENEVER we hear about how laws were passed keeping gin houses away from towns and villages, and how laws were passed to prevent cottonseed being thrown into the water courses, we feel like patting ourselves on the back to think how much we have done to extract valuable oil from the once despised cottonseed and how we obtain cattle food and rayon from what is left.

Some of us remember the time when most of the oil went into the soap kettles or was burned in miners' lamps, especially in off oil years. We do not have to go back much over forty years to find that the oil used for lard compounds was used sparingly, and did not improve the compounds a little bit. Now thanks to the work of the chemist, our vegetable shortenings consist entirely of cottonseed oil and are, in most respects, better than the animal product.

In converting the crude oil into refined, we have a process which is 96.5% efficient. Not perfection by any means but much better than the efficiency of press-room work, which obtains on the average only about 84.5% of the total crude oil in the seed and converts the balance into cattle food and fertilizer, overlooking the fact that the protein of the seed, properly prepared, can be made into a valuable food for the human race.

At the present time the oil in the seed is worth about 10 cents per pound, when refined. The cheapest vegetable protein in a concentration of 20% is that of beans, which is worth at 10 cents per pound for beans about 45 cents per pound. Cottonseed containing 17% protein would carry 340 pounds per ton and be worth on the basis of bean protein $153.00 per ton. As a matter of fact, cottonseed protein has a higher biologic value and should be worth more, several times as much in fact. To utilize this protein is plainly the work of the chemist and the chemical engineer.

We all know that by the proper application of solvents 50 to 55 pounds more crude oil per ton of seed can be made available. We also know that the gossypol and gums can be removed from the meats at the same time. It is also known that with proper handling the crude oil obtained by extraction can be refined and bleached as well or better than that obtained by pressing. With purified solvents the flavor of the extracted oil can be made equal to the pressed oil. With suitable apparatus the solvent losses should cost not far from press cloth under present methods, and the labor should be much less.

In Europe, solvent extraction plants are fast superseding the press rooms for soya beans, copra, palm-kernel and other oil bearing materials. In this country they are used for taking the grease from garbage, cracklings, linseed and other substances.

Solvents have not been used on cottonseed in the past because with improper methods and lack of knowledge of the fundamental requirements of operation it has been impossible to obtain refinable oils. Recent experiments show that these difficulties can be overcome, and with suitable separation machinery it is possible to prepare a meal running from 60 to 65 per cent protein.

Shall we, as chemists, bring about these results or follow the example of the Irishman who when told to clean and open some oysters served the shells and told the boss that he had cleaned them entirely.

Refining Committee Report

Constructive Progress Achieved in Laboratory Methods on Several Important Types of Oil

By C. B. CLUFF, *Chairman*

THE program of work for the past year was as follows:

(a) Refining procedure for peanut oil.

(b) Refining procedure for coconut oil.

(c) The effect on the F.F.A. test of using hot alcohol; also use of benzol or gasoline.

(d) Color of refined oil as affected by different kinds of filter paper, etc.

(e) Change in time of agitation in the hot bath on certain crude cottonseed oils.

The detailed investigation work was carried out mostly in the Procter & Gamble laboratories by an investigator at the expense of the Society, as in the previous two years. We believe this is the only satisfactory way where any volume of work has to be handled.

Peanut Oil

FIVE samples have been worked on ranging in F.F.A. from 1.4% to 4.7%. Some were from Texas and others from the Southeast. The effect of varying each important point in the procedure was studied. We recommend the adoption of the method submitted herewith.

Coconut Oil

SEVERAL lots of oil were studied along the same lines as applied to peanut oil, and we also had the benefit of previous work on this problem done by others. We recommend the adoption of the method submitted herewith.

Free Fatty Acids

THE use of hot alcohol instead of cold, and likewise the addition of benzol or gasoline to the oil in the F.F.A. test, were all found to tend towards somewhat sharper end points and quicker separation as applied to most oils, but it is the opinion of the Committee that the advantages are too slight to warrant the additional complications involved. Hence we recommend no change.

Color of Filtered Oil

THE following facts have been established. Some oils show different color readings when filtered through different brands of paper. In some cases the first oil through the paper is noticeably darker than the last oil through. These differences are especially marked on some cold pressed oils, especially if refined with lyes weaker than 20°. Apparently a small amount of colloidal matter passes through the filter paper in some of these cases, but this can be retained by using a better grade of paper or by filtering with the addition of a small amount of filter-cel. The action of filter-cel in this case is purely absorptive, as it has no bleaching power of its own and merely gives the same color as can be obtained by filtering the same oil through a higher grade of paper without filter-cel.

Comparisons were made by various members using different papers, including the following:

Eaton-Dikeman	No. 615
Reeve Angel	No. 230
Reeve Angel	No. 290
Whatman	No. 40
Sargent	No. 500
Eimer & Amend	"White"

We are not ready to recommend a definite brand or grade of filter paper, but recommend further work on this point next year, and in the meantime, recommend changes in the refining method, specifying first, that the filter paper used for filtering refined oil must be a *high grade* white paper; secondly, to require that the first 50 cc. of oil through the filter paper must be returned to the filter before collecting the sample for color reading.

Change in Time of Agitation

THE change as printed in the trading rules allowing the operator to use any period desired between 12 minutes and 20 minutes in the hot bath on such oils as he thinks do not break well, has not had the approval of this Society nor of its Refining Committee, nor of the Chemists' Committee of the National Association. It is a change in the rules of the National Cottonseed Products Association only, and it should be understood that up to this time there has not been any change in the official methods of this Society, which still specify 12 minutes agitation in the hot bath for all oils. The oils affected by this provision originate mostly in West Texas and Oklahoma. The Refining Committee has been considering

for several years how to provide for best refining of these peculiar oils without allowing discretion to the operator, but has found it a difficult problem to solve satisfactorily. The Committee has voted unanimously against allowing any discretion to the operator either as to the period of agitation, or as to selecting which oils, if any, should have a longer period of agitation. The Committee is likewise opposed to setting any *geographical* limits within which all oils should be required to be agitated longer than 12 minutes.

After full consideration of this matter, we now unanimously recommend the following as the best and most practical solution of this matter.

To insert in the method for refining procedure, the following sentence after the sentence covering agitation in the hot bath, so that the two sentences, old and new, will then read as follows:

"Then immediately transfer to the 65° C. hot water bath and stir at 70±5 R.P.M. for 12 minutes. On oils designated by the seller as 'slow breaking oils', the period in the hot water bath shall be 20 minutes in all cases instead of 12 minutes."

We also recommend that the Society ask the National Association to substitute this second sentence in place of the corresponding sentence as printed in the last edition of the official rules, and in addition to this change, the addition of a new rule to be known as No. 57, to read as follows:

"Seller may indicate on any invoice for shipment of crude oil the nature of the oil as 'cold pressed type' or 'slow breaking type'. Oil so designated shall be refined by the special procedure provided in the 'Methods of Analysis' for such oils; oil not so designated shall be refined as provided for regular hydraulic oil."

Also to eliminate the last sentence of the present Rule No. 55.

The effect of these changes will be to set up a third class of crude oils to be known as "slow breaking" oils. This will be handled, when traded in, exactly as cold pressed oils have been handled for many years, in that the nature of the oil should be declared by the seller on the invoice when the oil is shipped. Oils so designated must then be refined with the long period of hot agitation by all chemists without any discretion in the matter. We believe that this will satisfy all requirements and take away all chance for differences due to opinions of different operators in handling refinings, and will give the producers of slow breaking oil the benefit of any improved results that may come from the longer agitation, regardless of whether they are in West Texas or elsewhere, and at the same time will avoid penalizing producers of normal oil by subjecting their oils to unnecessarily long agitation.

Summary

OUR recommendations may, therefore, be briefly summarized as follows:

(a) Adoption of tentative refining method for peanut oil, further work to be done by new committee.

(b) Adoption of tentative refining method for coconut oil, further work be done by new committee.

(c) No change in the present F.F.A. test for crude oil.

(d) Further work to be done on color of refined oil as affected by filtering conditions.

(e) Period of agitation in hot bath on oils designated as "slow breaking" oils to be extended to 20 minutes in all cases, with suitable changes in the National rules to cover this.

Tentative Method for Refining Crude Peanut Oil.

CHOICE of Lye. On oils with F.F.A. not exceeding 3%, make three refinings as follows:

(a) 12° lye in the amount equal to 60% of the maximum calculated from the formula for hydraulic crude cottonseed oil.

(b) 16° lye in the amount 60% of that calculated from the cottonseed formula.

(c) 16° lye in the amount 80% of that calculated from the cottonseed formula.

On oils with F.F.A. over 3% make three tests with the following lyes:

(d) 16° lye in the amount 60% of that calculated from the cottonseed formula.

(e) 16° lye in the amount 80% of that calculated from the cottonseed formula.

(f) 20° lye in the amount 80% of that calculated from the cottonseed formula.

The correct amounts of lye for different percentages of F.F.A. are shown in the table.

Agitation. 30 minutes at 250 R.P.M. in water bath at 20-24° C., and 12 minutes at 70 R.P.M. in water bath at 63-67°C.

Balance of procedure to be the same as for crude cottonseed oil.

Tentative Method for Refining Crude Coconut Oil.

MELT the contents of the can by immersing the entire can in a large bucket of hot water maintained at about 100°F. for several hours or until the oil is completely melted. Then mix thoroughly and determine the F.F.A.

Strength of lye shall be 20° in all cases. The amount to be used shall be found from the following formula:

F.F.A. x 1.25= % of 20° lye

Procedure. Bring the oil to a temperature of 30-35°C., add 1% of dry table salt, then add the lye, and agitate in a water bath at 30-35°C. for 15 minutes, with agitator running at 250 R.P.M. Then agitate 12 minutes at 70 R.P.M. in the water bath maintained at 63-67°C. The remaining procedure will then be the same as for cottonseed oil, but the oil must always be kept at a temperature of 26°C. (78°F.) or higher, in order to keep the oil liquid. The last small portion of oil can best be removed from the surface of the foots by means of a pipette.

LYE REQUIRED TO BE USED ON PEANUT OILS

F.F.A.	12°	16°	16°	20°	F.F.A	16°	16°	20°
.1	4.2	3.0	4.0		5.1	8.3	11.1	8.4
.2	4.4	3.2	4.2		5.2	8.4	11.2	8.6
.3	4.5	3.3	4.4		5.3	8.5	11.3	8.7
.4	4.7	3.4	4.5		5.4	8.6	11.4	8.8
.5	4.8	3.5	4.6		5.5	8.7	11.6	8.9
.6	4.9	3.6	4.7		5.6	8.8	11.7	9.0
.7	5.0	3.7	4.9		5.7	8.9	11.8	9.1
.8	5.2	3.8	5.0		5.8	9.0	12.0	9.2
.9	5.3	3.9	5.2		5.9	9.1	12.1	9.3
1.0	5.5	4.0	5.3		6.0	9.2	12.2	9.4
1.1	5.6	4.1	5.4		6.1	9.3	12.3	9.5
1.2	5.8	4.2	5.6		6.2	9.4	12.5	9.6
1.3	5.9	4.3	5.7		6.3	9.5	12.6	9.8
1.4	6.1	4.4	5.8		6.4	9.7	12.8	9.9
1.5	6.2	4.5	6.0		6.5	9.8	12.9	10.0
1.6	6.4	4.6	6.2		6.6	9.9	13.0	10.1
1.7	6.5	4.7	6.3		6.7	10.0	13.2	10.2
1.8	6.7	4.8	6.4		6.8	10.1	13.3	10.3
1.9	6.8	4.9	6.6		6.9	10.2	13.5	10.4
2.0	7.0	5.0	6.7		7.0	10.3	13.6	10.6
2.1	7.1	5.1	6.9		7.1	10.4	13.7	10.7
2.2	7.3	5.2	7.0		7.2	10.5	13.9	10.8
2.3	7.4	5.3	7.1		7.3	10.6	14.0	10.9
2.4	7.6	5.5	7.3		7.4	10.7	14.2	11.0
2.5	7.7	5.6	7.4		7.5	10.8	14.3	11.1
2.6	7.9	5.7	7.6		7.6	10.9	14.4	11.2
2.7	8.0	5.8	7.8		7.7	11.0	14.6	11.3
2.8	8.1	5.9	7.9		7.8	11.1	14.7	11.4
2.9	8.3	6.0	8.0		7.9	11.2	14.9	11.5
3.0	8.4	6.1	8.1		8.0	11.3	15.0	11.6
3.1		6.2	8.2	6.4	8.1	11.4	15.1	11.7
3.2		6.3	8.4	6.5	8.2	11.5	15.3	11.8
3.3		6.4	8.6	6.6	8.3	11.6	15.4	11.9
3.4		6.5	8.7	6.7	8.4	11.7	15.6	12.0
3.5		6.6	8.8	6.8	8.5	11.8	15.7	12.1
3.6		6.7	8.9	6.9	8.6	11.9	15.9	12.2
3.7		6.8	9.0	7.0	8.7	12.0	16.0	12.3
3.8		6.9	9.2	7.1	8.8	12.1	16.2	12.4
3.9		7.0	9.3	7.2	8.9	12.2	16.3	12.5
4.0		7.1	9.4	7.3	9.0	12.3	16.5	12.6
4.1		7.2	9.6	7.4	9.1	12.4	16.6	12.7
4.2		7.3	9.8	7.5	9.2	12.5	16.8	12.9
4.3		7.4	9.9	7.6	9.3	12.6	16.9	13.0
4.4		7.5	10.1	7.7	9.4	12.7	17.0	13.1
4.5		7.6	10.2	7.8	9.5	12.8	17.1	13.2
4.6		7.7	10.3	7.9	9.6	12.9	17.2	13.3
4.7		7.9	10.5	8.0	9.7	13.0	17.4	13.4
4.8		8.0	10.6	8.1	9.8	13.1	17.5	13.5
4.9		8.1	10.8	8.2	9.9	13.2	17.7	13.6
5.0		8.2	10.9	8.3	10.0	13.3	17.8	13.7

Report of 1929-30 Color Committee

THE Committee very carefully considered the recommendation passed by the Society at the last annual meeting that the Committee recommend a tintometer giving all details and measurements for adoption as a standard instrument. It was impossible for the Committee to agree, and, for this reason, will make no recommendation but leave the matter as it stood at our last meeting.

The question of the uniformity of the color of Mazda Day Light Lamps was taken up at length with the National Lamp Works of the General Electric Company as some members of the Society had suggested the use of the true photographic daylight 100 Watt lamp, thinking it would be more uniform and give better satisfaction. We were advised that they did not manufacture a true photographic daylight 100 Watt lamp, and should they undertake to make up such a lamp for us that we would naturally encounter a much wider variation than we would in their standardized product. Dr. Luckiesh, Director of the Lighting Research Laboratory, advises us that the photographic Mazda lamp is not made up in small wattage as low as 100, and that it is not what we desire because it was developed strictly to give photographic daylight, and not the light we desire. Our conclusion is that the Mazda Day Light 100 Watt Lamp is the most uniform source of illumination for tintometers known at the present time.

We are unable to report any progress on the photo-electric color analyzer as to its application for determining the colors of oils. The Committee was very anxious to cooperate in this matter, and are sorry that we are not able to report any progress.

The question of standard filter paper for filtering the refined oil before determining the color was brought up, but since this matter is being studied by the Refining Committee, and properly comes under that Committee, we did not think it wise to take up this question, but would like to concur with the Refining Committee in emphasizing the importance of using a very high grade white filter paper in all cases.

The following are offered as suggestions to the future Color Committee for consideration in case they should desire to change any of the present type tintometers or develop an entirely new one:

First: Substitution of a standard gelatin or glass "day light" screen or plate for the standard day light lamp.

Second: That the two fields, that is, the oil and standard glasses, be arranged so as to be as close together as possible, but if prisms are used in the arrangement, it should have the approval of high authorities in optical principles.

Third: That mechanical means be provided for the changing of glasses.

Fourth: That the instrument be dust proof.

Fifth: That the source of light be such that the rays reaching the magnesia block be completely diffused.

Sixth: That the source of illumination be strong enough to illuminate the field, but not strong enough to give a glare which would be tiring to the eyes.

Seventh: That the instrument be arranged with a device for introducing and removing the tubes holding the oil.

Eighth: That the Committee keep in close touch with Dr. Hardy of the Massachusetts Institute of Technology, and the General Electric Company as to the progress being made for determining the color of oils or melted fats by the use of the Photo-electric Color Analyzer.

W. D. HUTCHINS,
Chairman

Report of Detergents Committee

THE Committee this year reports progress but has no recommendation for a completed test of detergency.

The objective of the Committee is to devise a test which can be conducted in any laboratory to compare detergent action of soaps and eventually other cleansing materials. Detergent action in practice is extremely complicated, and the Committee feels it necessary to work toward the reduction of variables to the smallest possible number. To this end it has been decided to soil standard Utica sheeting with two pigments separately, a carbon black which has been extracted to render it freely miscible with water, and an umber representative of earthy materials. It has been found that a suspension of the particular umber selected containing approximately five grams per hundred cc. of distilled water when agitated at room temperatures with a piece of sheeting approximately 6½ x 3¾ inches will cause a stain which, after the cloth is passed through the tight-set rolls of an ordinary household clothes wringer, reaches an end point on the completion of something less than ten cycles. The cloth is then rinsed in distilled water until little pigment is released and is dried without ironing.

No starches, oils, or other organic materials are included because their presence is known to cause such changes that different results are obtained with freshly soiled and older materials. There is also some evidence to justify a working hypothesis that the solid insoluble material is the fraction of dirt which is ordinarily the last to be removed from the fabric and hence if detergents are to be evaluated on a basis of their ability to produce commercially clean fabrics their behavior with respect to the solid dirt is of primary importance. The Committee has not lost sight of the fact that oily and starchy materials affect the difficulty of removing soil, but this may be due to their influence in affecting the physical relationship between pigment and fabric.

Cooperative tests are planned to compare the action of tallow and olive-castile soaps at a concentration of .2% at a temperature of 150° Fahrenheit by washing in the Launder-Ometer for twenty minute intervals, the soap solutions being replaced without intermediate rinsing and the operations continued until the soiled cloth in the form of a bag containing a 56 gram load of ¼ inch Monel metal balls, matches the color of a blank made from the same cloth unsoiled and treated identically with the soiled sample in a separate jar. The end point will be taken as the point at which the soiled sample and the blank are judged to match, any available method of comparison being used according to the judgment of the operator, the number of cycles necessary to bring this about to be taken as the index of detergent action. A copy of the specifications being circulated to the Committee is attached.

Minutes of Detergent Committee of A. O. C. S. Meeting at Bureau of Standards, Washington, D. C., 4-5-30

THE chairman opened the meeting by reminding the committee that the task before it was to devise a reliable method for evaluating soaps according to their actual detergent power, which method could be followed by any laboratory. He also reviewed the several contributions of data made by members of the committee since the New York meeting.

A tentative outline of specifications for the next washing test was presented as a basis for discussion. In this, the most marked departure from previous practice was in the method of soiling, which employed, as materials, only cloth, water and pigment. A demonstration of the proposed method was given. There was active discussion on many of the points covered by the outline, resulting in the following decisions:

Cloth: Utica sheeting was selected. This should be as free as possible from sizing material. The chairman was authorized to learn from the manufacturer how this condition best may be secured, and to furnish cloth for the washing tests to cooperating members.

Soiling: This is to be done by each member, using umber and carbon black pigments,

supplied by the chairman, and known to be satisfactory for the method as shown before the committee. That method is to be followed, and each member is to send to the chairman samples of soiled cloth, for comparison.

Shape of Cloth: The bag form was adopted for the next test. Each bag is to contain 50 Monel metal balls of so-called ¼ inch size, (to be supplied by the chairman). Two bags are to be used in each jar.

Washing materials: Tallow and olive-castile soaps were adopted for next test. (To be supplied by the chairman.)

Solutions: These are to contain .2% soap as furnished (2gm soap to 1000 cc.).

Washing: This is to be done by successive portions of soap solutions, without intermediate rinsing until the washing is finished. Blanks of unsoiled cloth are to be treated in parallel fashion in separate jars. The washing is to be considered as finished when the main portion of the soiled specimen reaches the same color as the unsoiled blank.

Judging: After rinsing and drying, the identity of the soiled specimen and the blank is to be judged by any means available to each operator.

The chairman was authorized to embody these decisions, and further details which appeared in the tentative outline and were approved without such discussion, in a set of specifications for the next test.

It was decided to ask members of the committee to cooperate by making a series of washing tests in their own laboratories, according to the new specifications which are to accompany copies of the minutes of this meeting.

Among other matters discussed were: The function of oily substances in soiling: the rates at which oil and pigment are removable from cloth; and the advisability of judging detergent power by comparison during the early stages of washing, rather than at the end of the process. The importance of these matters was recognized. The sentiment prevailed, however, that the committee should not enter upon them in the present stage of its work.

Thanks were expressed to the Bureau of Standards for its hospitality.

The Members attending the meeting were: Percy H. Walker, Bureau of Standards, Washington; F. W. Smither, Bureau of Standards, Washington; Wm. Stericker, Phila. Quartz Company, Phila.; James C. Vail, Phila. Quartz Company, Phila.; John D. Carter, Phila. Quartz Company, Phila.; Ralph T. Mease, Bureau of Standards, Washington; N. S. Boucher, Lever Bros. Co., Cambridge, Mass.; M. L. Sheely, Armour and Company, Chicago; Foster Dee Snell, Cons. Chem., Brooklyn, N. Y.; W. C. Preston, Procter and Gamble, Cincinnati; W. H. Burkhart, Gold Dust Corporation, Baltimore; Wm. D. Appel, Bureau of Standards, Washington; F. H. Guernsey, Cowles Detergent Company, Cleveland, Ohio; L. T. Howells, Cowles Detergent Company, Cleveland, Ohio; E. B. Millard, Mass. Inst. Technology, Cambridge.

National Oil Building Addition

National Oil Products Co., Harrison, N. J., manufacturers of oil specialties for the textile, leather, disinfectant and other industries, is building a $250,000 addition to its Harrison headquarters. The new four story building, which will be ready for occupancy in October, will provide 25,000 square feet of additional floor space. It is of modern fireproof, brick and steel construction. Two of the floors will be devoted to laboratories, and the balance of the space will house the new offices. Metasap Chemical Co., a subsidiary, manufacturers of chemical driers for the paint and printing ink industries, will also be quartered in the new structure. National Oil Products Co., incorporated in 1907, first occupied a small rented building. Only two sulphonated oils and chip soap were manufactured. The soap line was discontinued as the company continued to develop the sulphonated oil end of its business. In 1910, National Oil moved to its present address, with railroad sidings and a wharf on the Passaic River, Metasap Chemical Co. was organized in 1915 and at about the same time a Chicago office was established. Later, branch offices were placed in Charlotte, N. C., and Boston. About two years ago a branch factory was established at Chicago. In addition, the company operates an office and refinery in St. Johns, Newfoundland, and an office in Hamburg, Germany. Officers of the company are Mark A. Richards, president, John H. Barton, vice president, Charles P. Gulick, treasurer, and G. Daniel Davis, secretary.

Gold Dust Corp. has announced redemption of American Linseed Company 6% coupon notes, dated as of June 15, 1925, at 100½% and interest on June 15, 1930.

The Analysis of Sulphonated Oils*

Report of American Leather Chemists' Association Committee

By G. W. PRIEST

WHEN I made my committee report a year ago on a method for the determination of neutral oil in sulphonated castor oil, the work was more or less incomplete and I requested further time for study. Some question has arisen since then concerning what was meant by neutral oil in this particular case. I assumed that, as there was no difficulty in determining the unsaponifiables by the usual methods and that neutral oils other than castor were separable by petrolic ether or by calculation according to our A.L.C.A. methods, the problem of the committee was to work out an accurate method for the determination of neutral oil due to castor oil alone, and if possible one that was reasonably rapid and foolproof.

In order to find a definition of neutral oil in a sulphonated oil I consulted several oil chemists and we came to the conclusion that the following would be a good one. In using the term neutral fat the A.L.C.A. uses the right term. Neutral fat then may be defined as all neutral saponifiable matter which exists in a sulphonated oil. This does not include such materials as ammonia soaps and salts, because the ammonia soaps are already saponified and cannot be classed a ssaponifiable matter and the latter are not soaps and the reaction is not one of saponification. In spite of this broad definition we proceeded to study sulphonated oils which we knew contained nothing at the start but pure castor oil.

Most of my business life has been spent in the manufacture of patent leather and the study of chemical problems which are related to it. My experience with castor oil in the plant and laboratory leads me to believe that there is a loose hydroxyl group in the molecule which wanders, often into combinations which are injurious and in the laboratory exceedingly difficult to detect and isolate. After my experience of last year I approached the problem with many misgivings. Before starting on the study I got in touch with several manufacturers of sulphonated castor oil to ascertain what their neutral fat control was, and found the situation to be about as follows. They buy a technically pure castor oil and sulphonate it according to their usual procedure, assuming that they get from two to three per cent neutral fat in a highly sulphonated oil and ten to fifteen in a less highly sulphonated one. They rarely analyze it for neutral fat on account of the length of time required for the analysis and its complications. They use, when a determination is essential the method of Lewkowitsch which was suggested by Bumcke and which I retained as a tentative method until I found something as good or better. One of the members of this committee who is technical director of a large laboratory later corrected his statement about the use of the Lewkowitsch method as follows and suggested the trial of a modification of method No. 5 of last year. He writes that "in using petroleum ether rather than sulphuric ether in this determination we are choosing the lesser of two evils. Whereas the petroleum ether will tend to give high results by dissolving some of the soap, we have found that in attempting to make corrections for the soaps dissolved by the sulphuric ether, greater losses were involved which brought the results close to those attained by petrolic ether." Below are the two methods.

Modified method of Lewkowitsch — Ten grams of the sample are dissolved in 50 cc. of water, 20 cc. of ammonia and 30 cc. of glycerine are added and the mixture is extracted twice with ether, using 100 cc. for each extraction. The ethereal solution is then washed three times with water to remove small quantities of dissolved soap and the ether evaporated off. The residue is transformed to a small tared beaker, dried at first on the water bath, then at 100° C. and weighed to constant weight.

*Reprinted by permission from the Journal of the American Leather Chemists' Association.

	215 mg KOH per gram	%	216 mg KOH per gram	%
Total Alkali (A)	44.83		25.78	
(R)	—14.86		—8.65	
SO_3 .1426 (A + F)		4.274		2.24
Neutralized Combined SO_3		6.37		3.56
Moisture		26.55		24.34
Ash		4.00		1.96
Unsaponifiable		.66		1.69
Saponification No. (Uncorrected) E°	128.13		143.23	
Free and Comb. Fatty Acids (B)	72.36		77.10	
Alkali Minus NH_3 (C)	—4.32		—21.17	
NH_3[.030357 (A-C)]		1.49		1.43
Free Fatty Acids (B-A)	27.53		51.32	
Sodium Sulphate in Ash due to combined SO_3		3.25		0
Sodium Carbonate in Ash due to combined fixed alkali comb. as soap		0		0
Total salts and impurities		.75		1.96
Sodium bound as soap		0		0
Total fatty matter		64.18		67.02
Oleic Acid		36.40		38.78
Neutral Fat		27.78		28.24
Neutral Fat (Extraction method)		13.05		16.64
Neutral Oil (Extraction method)	(sulfuric ether)	13.71		18.33
Neutral Fat (Extraction method)				13.31
Neutral Oil (Extraction method)	(petrolic ether)			15.00
Sapon. Equiv. of Fatty Matter E°	128.13 mgms KOH		143.23 mgms KOH	
Sapon. Equiv. Neutral Fat En	51.45 mgms KOH		44.96 mgms KOH	
Neutral Fat Hart Method		26.18		24.68

	⌐—No. 243 lot 2657—¬ mg KOH per gram	%	⌐—No. 244 lot 2681—¬ mg KOH per gram	%
Total Alkali (A)	38.40		17.50	
(F)	—4.09		18.55	
SO_3 .1426 (A + F)		4.89		5.14
Neutralized Combined SO_3		7.28		7.66
Moisture		26.50		32.14
Ash		10.03		7.98
Unsaponifiable		0.25		0.27
Saponification No. (This En does not include Free Fatty Acids, Ammonia as Soap or Ammonia as Salts)	36.93		61.74	
Free and Comb. Fatty Acids (B)	77.61		54.34	
Alkali — NH_3 (C)	38.40		17.50	
NH_3 [.030357 (A-C)]		0.00		0.00
Free Fatty Acids	39.20		36.84	
Na_2SO_4 in Ash due to combined SO_3		8.70		6.79
Na_2CO_3 in Ash due to combined fixed alkali combined as soap		0.39		0.00
Total Salts and Impurities		0.94		1.19
Sodium bound as soap		1.57		0.72
Total Fatty Matter		63.46		58.12
Oleic Acid		39.04		27.33
Neutral Fat		24.42		30.79
Neutral Fat (Ether extraction)		9.14		15.06
Neutral Oil (Ether extraction)		9.39		15.33
Neutral Fat (Petrolic Ether ext.)		5.02		8.78
Neutral Oil (Petrolic Ether ext.)		5.27		9.05
Saponification Equivalent of Fatty Matter	E° 76.14 mgms KOH		98.58 mgms KOH	
Saponification Equivalent of Neutral Fat	En 36.93 mgms KOH		61.74 mgms KOH	
Neutral Fat Hart Method		20.45		30.91

NEUTRAL FAT EXTRACTION METHODS

	215	216	243	244
Ether	13.05	16.64	9.14	15.06
Pet. Ether	——	13.31	5.02	8.78

Petrolic ether method—Weigh 10 grams of sample into a 250 cc. Erlenmeyer flask. Add 50-70 cc. of Alcohol and a few drops of phenolphthalein, then add slowly N/2 NaOH until neutral. Extract three times in a separatory funnel. Wash extract three times with water. Evaporate and dry with usual precautions. The only other suggestion which I had received was that the ether extract in the Lewkowitsch method should be corrected for dissolved soap.

Before sending samples of oil out to the committee for study, I determined to do some work in order to test out further the two methods and in particular the correction for soap included in the ether extract. I had prepared for me by manufacturers of sulphonated castor oils four samples made from pure castor oil numbered as follows: 215-216-243-244. I had hoped that I might also find some new volatiles or mixtures which might be used successfully for separation of neutral oil but everything tried failed. Below I quote from our laboratory report.

"We believe that these four oils have been prepared from technically pure castor oil. Judging from the performance of these oils under the two methods in our laboratory alone we would have been fairly well satisfied. No. 216 gave us the greatest trouble in the separation of the emulsions. However, we succeeded in completing the analysis in about ten days. The other oils gave us little trouble in the extractions, but we found it more or less difficult to wash the extractions with water and get good separations." "Prolonged and careful study of soap in the ether and petroleum ether extract showed that each carried over the same amount, to the extent of about 1 per cent. As we are not sure that this is soap we have not shown the correction."

At this time it appeared that if a determination of neutral fat was to be made on a sulphonated castor oil, there was only one thing to be done and that was to take the necessary time and precautions for the ether or petrolic ether methods which would mean as far as time went from three days to a week. For control work I was willing to do this. On page 266 is a tabulation of the results of continuous work extending over more than two month. This work was done in triplicate and the checks were very close. The work was as carefully and painstakingly done as in any research laboratory and performed by two very skilful oil chemists. I have every confidence in the accuracy of the results as far as the limitations of our laboratory equipment goes.

This corroborates our work of a year ago that petrolic ether while speeding up the work by giving sharper breaking emulsions was too low in results for accuracy.

The manufacturer of oils Nos. 243 and 244 recommended the petrolic ether method for determination of neutral fat reported the following figures.

	243	244
Neutral Fat	12.27	20.85

I have great confidence in his laboratory technique and have never had more than a fraction of a per cent difference in our check ups on other oil analyses, and am at a loss to explain this difference. Many complications can and do occur during analysis of castor oils which cause polymerization. In some cases the ether residue after complete aqueous wash and drying to constant weight was not soluble in alcohol and in other cases it was. The drying of such oily residues should be done either in vacuo or in a stream of inert gas. I had no such apparatus. It became apparent as time went on that I was dealing with a very complicated problem, but as I was about to send out samples to the committee, Ralph Hart published his paper in A.L.C.A. JOURNAL and I immediately got in touch with him and sent him the results of our analytical work so that he could figure out the percent of neutral fat by his titration method. I was a bit skeptical when the results came back, but noticed that there was a relationship between his figures and ours. In a paper written by him which will shortly appear are quotations from reports of research work which is being done abroad and which would make it appear that our conceptions of neutral fat in a sulphonated castor oil will have to be changed. During sulphonation some polymerization takes place which makes a water soluble castor product, and also leaves some unchanged castor oil. The titration method shows both of these products and is a true value of the oil. While we get by our regular method a figure by calculation, Hart's new method gives us one which is obtained directly. It will be observed in the paper which he is about to publish that our A.L.C.A. method of which he is the father, does not differ more than two or three per cent from this direct titration method.

Conclusions

THE method of Lewkowitsch as outlined, using ether, in skilled hands and with the use of vacuum drying ovens or one having a stream of inert gas during the drying period of the ether extract gives a partial measure of neutral fat in a sulphonated castor. The

(*Turn to Page* 275)

Notes of the Industry

Gold Dust to Retire Debt

Gold Dust Corporation is preparing to retire its funded debt of $11,000,000 out of surplus, according to a recent report. It will not be necessary to resort to new financing to secure the necessary funds, as the surplus is ample to cover this amount. The earnings of the corporation during the quarter ended Mar. 31, 1930, are reported to be somewhat larger than the earnings during the corresponding quarter of 1929.

Discusses P. & G. Employment Plan

R. R. Deupree, vice-president and general manager of Procter & Gamble Co., Cincinnati, characterized the guaranteed employment plan under which the Procter & Gamble plans operate as an unquestionable success not only in terms of human happiness, but also in dollars and cents, at the recent dinner held in Hotel Ambassador, New York, to honor Colonel William Cooper Procter for his work in stabilizing employment. Mr. Deupree explained that although it had cost several million dollars to reorganize the business and its plants, it had paid in good-will and in economic benefits from stabilizing production and distribution which was necessary before the plan could be put into effect. The scheme is based on the sales executives planning a year in advance the production necessary to meet the demands of the public. This production is divided into weekly units and strictly adhered to. In the seven years the plan has been operated, the variation between production and shipments has been less than six-tenths of one per cent.

A material proving useful as a new medium for heat transfer is diphenyl, $C_6H_5 \cdot C_6H_5$, which is being produced in commercial quantities by the Federal Phosphorus Company. As an indirect heating medium, handled in much the same way as steam, diphenyl holds promise because of its high boiling point and low vapor pressure at elevated temperatures. Commercial diphenyl has a melting point at atmospheric pressure of 157° F., boiling point of 492° F. and a critical temperature of 980° F. It is known to be stable at 850° F. and does not readily attack steel or cast iron equipment.

A Doering Continuous Margarine Worker, recently installed in the Chicago plant of Wilson and Company, has effected substantial economies in the margarine working operation. The machine has an output capacity of 5,000 pounds of worked and salted margarine per hour of operation, with a smaller working crew than is necessary for the production of three-fifths the same amount on some other types of working equipment. A performance survey conducted by the A. C. Neilsen Company has demonstrated that the continuous worker pays an annual return of 183% on the investment in it, due to reduced operating costs.

W. A. Peterson, Chief Chemist of Kirkman and Son, Brooklyn soap manufacturers, has consented to serve as Secretary of the Soap Chemists' Section, American Oil Chemists' Society, again during the coming year. Mr. Peterson has been Secretary of the Soap Chemists' Section since its organization.

According to a report from the American Consul at Athens, the Ministry of Finance of Greece is considering the foundation of an autonomous olive oil organization for the management of the country's oil production. The object of the organization will be to control the marketing of the olive oil crop as to avoid violent price fluctuations.

A new castor oil mill is under construction at Cordoba, State of Vera Cruz, Mexico, according to a report from Consul Dawson at Vera Cruz. It is expected that the plant will be in operation by the beginning of the coming year.

Wilson and Bennett Manufacturing Company, Chicago, Illinois, steel container specialists have prepared a new catalogue, their number 80, descriptive of their entire line of steel pails, cans, drums and barrels. A copy of this catalogue will be forwarded upon request to any user of steel containers, without charge. Schibley and Ossman, Inc., of 428 Penton Building, Cleveland, Ohio, have been appointed Sales Representatives of the Wilson and Bennett Manufacturing Company in the Northeastern Ohio territory.

P. C. Kullman and Company, Investment Brokers, New York City, have prepared an attractive little folder giving the names of the ninety-two chemical elements, with the symbol, atomic weight, melting point and year of discovery of each. Kullman and Co. will furnish copies of this folder to anyone interested, upon request, without charge.

The Fifth Annual Convention of the Mayonnaise Products Manufacturers Association will be held at Haddon Hall, Atlantic City, October 27, 28 and 29. The Secretary of the Association announces that this will be a true "Fellowship Convention" and all members and others interested in mayonnaise are urged to attend.

Dr. Edward R. Weidlein, Director, Mellon Institute of Industrial Research, has announced that the facilities of the Institute are to be increased by the erection of a fine new laboratory building, to be seven stories in height and to provide ample space for many additional Industrial Fellowships besides those now in operation at the Institute.

Wieting and Richter, Ltd., large provision merchants of British Guiana, are said to be establishing a small copra crushing plant and coconut oil refinery at Georgetown, British Guiana. The capacity of the plant is to be ten tons of refined oil per week, according to a report from the U. S. Vice Consul at Georgetown.

A new soap factory has been erected in Copenhagen, Denmark, by Henkel and Company, a subsidiary of Henkel & Co. of Dusseldorf, Germany.

Curtis and Tompkins, Ltd., Consulting Chemists of San Francisco, have issued an attractive booklet on the art of gauging and sampling tanks of all kinds containing oils, including ships' tanks, tank cars and storage tanks. The booklet is well prepared and complete, and contains useful tables of specific gravities, weights, volumes and weight per gallon of various vegetable oils. Copies of the booklet may be obtained gratis upon request to Messrs. Curtis and Tompkins.

Oil Trades Association of New York, recently issued its year book for 1930-1931, listing the member companies of the association, their representatives, the officers and directors of the association and the standing committees. A copy of the constitution of the association is also included in the book.

Dr. Martin H. Ittner, chief chemist of Colgate-Palmolive-Peet Co., at its Jersey City plant, received the honorary degree of Doctor of Science from Colgate University at its recent commencement. He is a graduate of Washington University from which he received the degrees of Bachelor of Science and Bachelor of Philosophy. He also holds the degrees of Master of Arts and Doctor of Philosophy from Harvard. He has been connected with Colgate & Co. for 34 years.

Oil Traders' Outing at Briarcliff

Approximately two hundred members and guests of the Oil Trades Association of New York were present at the annual outing which was held at Briarcliff Lodge, Briarcliff, N. Y., June 12. The group gathered at Battery Place early Thursday morning where busses were waiting to make the trip up the Hudson. Those who drove up in their own cars were able to get rounds of golf under their belts before lunch when the whole party was gathered together in the Casino. A baseball game between the vegetable and mineral oil groups was an additional attraction in the afternoon, and resulted in a 13 to 10 victory for the latter team. A. V. Merklen of Pigot, Sayre Co., pitched for the winners, with Phil C. Meon backing him up. The other members of the winning team were Messrs. Christie, Smith, Davison, Robinson, Strubel, Hand, Lindsay and Valter. Each was presented with a mahogany desk clock. Jim Sheehan, of Fiske Bros. Refining Co., and F. G. Fanning, of Lubraa Oil Corp., were the battery for the losers. (The very mention of the latter's name to the mineral oil batters as they stepped up to the plate should have chilled them.)

Dinner was also served at the Casino and was followed by a short talk by C. T. Weihman of Smith-Weihman Co., president of the Association, in which he pointed out that modern ideas of sport are somewhat different than they were in the days when Knights invited out their best friends to an afternoon of armhacking and back-breaking. Now the sportsman vents his spleen on the inoffensive golf ball. Winners of golf prizes were announced by Austin Wharry. Albert J. Squier again served as chairman of the entertainment committee, assisted by Edwin Stern and G. A. Wharry who took charge of the golf tournament and prizes.

Van Camp-Jewel Merger

Under a plan of reorganization being submitted to the Van Camp Packing Company, Inc., stockholders, Jewel Tea Company, Inc., will obtain a substantial interest in that company, and M. H. Karker, president of Jewel Tea, will become its principal executive officer.

The proposal calls for the organization of a corporation, to be named later, which will acquire all the assets of Van Camp and will receive $2,500,000 in cash, to be raised through issuance of 6 per cent participating cumulative convertible preferred stock of an authorized issue of $3,000,000. Under the plan, Jewel Tea is to acquire $1,250,000 of the preferred stock, and the remaining $1,250,000 is to be underwritten by Lehman Brothers and Hitt, Farwell & Co. and offered to depositors of the various classes of Van Camp stock.

In addition to the fixed dividend of 6 per cent, the new participating preferred stock will be entitled to one-half of net earnings, after preferred dividends, up to an additional 10 per cent of its par value.

The plan further calls for the conversion of the $1,000,000 6½ per cent convertible prior preference stock into $1,000,000 6 per cent cumulative convertible second peferred stock and the conversion of $2,159,850 7 per cent preferred stock, $25 par, on a basis of two shares of common for one preferred, requiring the issuance of 172,788 shares of common stock.

This amount, in addition to 314,596 shares to be issued in exchange for present common and an additional 25,000 shares to be sold to Jewel Tea will result in 512,384 shares of common to be outstanding.

Van Camp Packing Company, Inc., was formed in 1921 to take over the properties and business of Van Camp Packing Company, established in 1861, and Louisville Food Packing Company. Late in 1928 Van Camp Milk Company was organized.

Jewel has an organization trained in matters of production, merchandising and control of an organization national in scope. Through its 1,235 routes it serves approximately 700,000 homes with its sixty-four regular grocery items sold under the Jewel trade name.

Hydro Patents Company

The Hydro Patents Company has been formed in Delaware by the Standard Oil Company (New Jersey), to have the exclusive right to license the hydrogenation process in and/or for the United States. The new company will pay certain fixed royalties to the Standard I. G. Company on account of each license granted and also certain running royalties.

Licensees will be required to own stock in the company and will be required also to enter into an agreement with the Hydro & Chemical Company; a new company formed to furnish licensees of the Hydro Patents Company technical knowledge of the Standard Oil Company (New Jersey) and I. G. Farbenindustrie, A. G., relating to the hydrogenation process.

The Hydro Engineering & Chemical Company will maintain stocks of catalysts for Hydro Patents Company licensees. An invitation to various units in the industry to subscribe to stock of the Hydro Patents Company will be extended.

Shortening and Oil Prices

Prices of shortening and salad and cooking oils on Thursday, June 26, 1930, based on sales made by member companies of the Shortening and Oil Division of the National Cottonseed Products Association, were as follows:

Shortening

	Per lb.
North and Northeast:	
Carlots, 26,000 lbs.	@10½
3,500 lbs. and up	@10¾
Less than 3,500 lbs.	@11¼
Southeast:	
3,500 lbs.	@10
Less than 3,500 lbs.	@10½
Southwest:	
Carlots, 26,000 lbs.	@10
10,000 lbs. and up	@10⅛
Less than 10,000 lbs.	@10½
Pacific Coast:	@10½

Salad Oil

North and Northeast:	
Carlots, 26,000 lbs.	@10¼
5 bbls. and up	@10½
1 to 4 bbls.	@11¼
3,500 lbs.	@10
Less than 3,500 lbs.	@10½
South:	
Carlots, 26,000 lbs.	@10
Less than carlots	@10¼
Pacific Coast:	@10¼

Cooking Oil—White

⅛c per lb. less than salad oil.

Cooking Oil—Yellow

¼c per lb. less than salad oil.

Mrs. Anna Schlorer Smith, of Mrs. Schlorer's Inc., Philadelphia, secretary of the Mayonnaise Products Manufacturers' Association, has gone to Europe to attend the international convention of the Soroptimist Clubs. Mrs. Smith is vice-president of the American Federation of Soroptimist Clubs.

ABSTRACTS

David Wesson, *Abstract Editor*

It is said that by treatment of a small drop of oil with a drop of potassium hydroxide in alcoholic solution, the saponification which proceeds will result in characteristic crystals, which, when viewed under the microscope, often serve to identify the original oil used. *Mikrochemie* 8,72-4 (1930), *Chemical Abstracts*, 24, 1755, (1930).

Fatty acids of drying oils of the linseed oil type may be treated with a sulfonating agent such as sulfuric acid at a temperature of approximately 55° C., the excess sulfonating agent being removed by washing. The product is claimed to have uses similar to those of Turkey-red oils. U. S. Pat. No. 1,745,221.

A proposed new method for the recovery of vegetable oils and fats involves the action of *Bacillus delbrucki*, which is said to produce an enzyme which will attack proteins, changing them into water soluble amino acids at 50° C. If a culture of the *Bacillus delbrucki* is mixed with copra, limestone and water to form a mush, then incubated with the exclusion of air, the oil can be recovered by filtration after about six days. *Ind. Eng. Chem.* 22, 117-8 (1930).

A method suggested for standardization of color measurements of oils involves referring the color to milligrams of iodine in potassium iodide solution, measured in a layer of definite thickness. *Chem. Umschau Fette, Oele, Wachse Harze* 37, 21-2 (1930).

It is asserted that the poisonous gossypol in cottonseed oil cake may be removed by heating with water. If the oil has been removed by pressing, the cake is ground 40 to 50 per cent of water is added, the mass heated for two hours at 1½ to 2 atmospheres pressures and then dried. The product is said to be free from gossypol. If the oil has been removed by solvent extraction, the last traces of solvent are removed by heating in vacuo, 40 to 50 percent of water is added and the whole evaporated under 2 atmospheres pressure. After drying finally in vacuo, the resultant residue is said to be gossypol-free. *Seifensieder-Ztg.* 52-3, (1930).

Animal and vegetable oils and fats may be bleached by treatment with sulfuric acid and a bleaching earth (the earth being added at least as soon as the acid). The mixture is agitated, the sludge formed allowed to settle, and the supernatant oil is filtered through a layer of diatomaceous earth. U. S. Pat. No. 1,744,843.

When oleic, linoleic and linolenic acids are subjected to the silent electric discharge in an atmosphere of hydrogen there is rapid hydrogenation and polymerization. In nitrogen, the two reactions take place much more slowly and the rate of polymerization is greater than that of hydrogenation. The hydrogen required in the latter case must come from decomposition of the fatty acids. In carbon monoxide or sulfur dioxide, there is neither hydrogenation nor polymerization. *J. Soc. Chem. Ind. Japan* 32, Suppl. Bind. 359-60 (1929).

It is stated that the abietic acid soap of triethanolamine is almost completely hydrolyzed in water solution. Oil-water emulsions in which triethenolamine oleate serves as the emulsifying agent may be prepared by mixing the oil solution of oleic acid with the water solution of triethanolamine; for example five parts by weight of oleic acid are dissolved in ninety-three parts of palm oil and the resulting solution mixed with one hundred parts of water containing two parts of triethanolamine. A mixture of turpentine, kerosene and orthodichlorbenzene has been successfully emulsified in water with triethanolamine and oleic acid in the presence of dyes, oils and abrasives to give a satisfactory polishing compound. *Ind. Eng. Chem.* 22, 143-6 (1930).

According to *Malayan Agr. J.* 17, 335-40 (1929), the average moisture content of Malayan estate copra is 7% and the loss of moisture during transit will vary from 2% to 3%. The average oil content, disregarding seasonal variations, is 66%.

The true iodine number of a fat or fatty acid denotes the amount of iodine absorbed to give a saturated halogen compound without any substitution. The iodine number of the constants is not necessarily the true iodine number since it represents a chemical equilibrium, where the iodine is divided between several fatty acids. The Wijs method for the determination of iodine numbers gives the true value. *Chem. Umschau Fette, Oele, Wachse u. Harze* 37,85-7 (1930).

The antioxidizing power of alpha-naphthol on linseed oil is stronger than that of beta-naphthol and the higher the temperature the greater the activity of the former. Because of volatility, it is difficult to make either naphthol hold its antioxygenic activity for a long time at elevated temperatures. *J. Soc. Chem. Ind. Jap.* Suppl. Bind. 33, 107-9 (1930).

Minute quantities of nitrous oxide and ammonia are said to act as negative catalysts in the hydrogenation of oils when nickel is used as the active catalyst. Prior treatment of the nickel catalyst with various anesthetics, such as urethan, barbital, brucine, cocaine hydrochloride and the like, retard the catalytic activity of the nickel. *J. Soc. Chem. Ind. Jap.* Suppl. Bind. 32, 318-23 (1930).

A qualitative test recommended for the detection of free caustic soda in toilet and grained soaps is as follows: add a few drops of phenolphthalein to 25 cubic centimeters of 96 per cent alcohol, then neutralize to a light rose tint; dissolve two grams of the finely divided sample in this alcohol with heat and exclusion of air. Cool, and if free caustic soda is present, the solidified mass will retain a distinct red color for at least one hour. *Seifensieder-Ztg.* 56, 402-3 (1929).

The potassium soaps of most oils and fats split off approximately one-half of their alkali content on hydrolysis, except the potassium soaps of castor oil, coconut oil or rosin, which split off from 6.1 to 26.3 per cent. Sodium soaps hydrolyze somewhat less than the corresponding potassium soaps. *Seifensieder-Ztg.* 56, 386-8 (1929).

According to Herbert G. French, vice-president of Procter & Gamble Company, business has been very much above average in all departments during the past three weeks. It is reported that an additional disbursement in the form of a stock dividend of possibly 2 or 3 per cent is likely to be forthcoming during the latter part of this year, in view of the company's excellent earnings prospects.

El Dorado Oil Co., which crushes copra, with mills at San Francisco, has been taken over by the Colgate-Palmolive-Peet Co., according to recent announcements. The acquisition of El Dorado by Colgate-Palmolive-Peet, negotiations for which were reported a month ago, gives the soap company a source of coconut oil independent of Philippine imports.

Sulphonated Oils

(*From Page 267*)

time needed for the analysis is so long and the care and patience required so great that many sources of error can creep in while the final figure is not an exact one. The modification using petroleum ether gives results much too low and should not be recommended as a standard method. Hart's method is a quick accurate method and appears to have behind it the weight of research work now being done overseas. It is evident that we are going to be obliged to change our ideas about the amount of neutral oil in a pure sulyhonated castor oil and to recognize that there is about 26 per cent of a fatty matter unsulphonated but saponifiable. I recommend that the committee make a study of this method for the coming year after Hart has published his paper.

The association is indebted to The Griess-Pfleger Tanning Company for its permission to allow its laboratory to give so much time to this work in spite of the fact that it uses practically no sulphonated castor oil. I am indebted to John W. Harnly, research chemist, of the above firm for the amount of work which he did and Kenneth Matzinger. Ralph Hart has met me in a spirit of rare cooperation and I am glad that it has fallen to his lot to help out the tanning laboratories once more, and to strengthen a seemingly weak spot in the A.L.C.A. method.

Referee Applicant

W. M. Black, of Augusta, Georgia, has applied for certification as Referee Chemist of the American Oil Chemists' Society. (*Second publication.*)

Prices

Candles, adamantine 6s 16 oz.			
20-set cases	**set.**	**.14½**	**.15¾**
40-set cases	**set.**	**.14**	**.14½**
Candles, paraffin, cs., 14 oz., case of 40 sets	**set.**	**.10**	**.10¼**
6s 14 oz., case of six cartons containing 36 sets	**set.**	**.11**	**.11¼**
6s 12 oz., 40 set cases	**set.**	**.09**	**.09¼**
6s 12 oz. cases of six cartons containing 36 sets	**set.**	**.10**	**.10¼**
Patent ends	**set.**	**.17¾**	**.18**
Stearin 6s 16 oz., plain, cases	**set.**	**.16¾**	**.17**
Castor, No. 1, bbls.	lb.	.12¼	.12½
No. 3, bbls.	lb.	.11¾	.12
Chinawood, bbls. or drs.	lb.	.09	.09¼
Coast, tanks, spot	lb.	.07⅞	.08
Futures	lb.	.08	—
Coconut, Ceylon grade, bbls.	lb.	.07⅜	.07½
Coast, Tanks, Domestic White	lb.	.05⅞	.06
Cochin grade, bbls.	lb.	.07¾	.07⅞
Manila, bbls.	lb.	.07⅜	.07½
Tanks, N. Y.	lb.	.06¼	.05⅜
Fatty acids, mill tanks	lb.	.09	nom.
Cod, Newfoundland, bbls.	gal.	.50	.56
Corpra, bags, coast	lb.	.03¾	.03⅞
Corn, tanks, mills	lb.	.07	.07⅛
Bbls., New York	lb.	.09	nom.
Refined, bbls.	lb.	.10	nom.
Fatty acids	lb.	.07½	nom.
Cottonseed, crude, tanks, mills	lb.	.07¼	—
P. S. Y.	lb.	.08⅛	—
Fatty acids, mill, bbls	lb.	.07¾	nom.
Degras, domestic, bbls.	lb.	.03¾	.04½
English, bbls.	**lb.**	**.04½**	**.05**
German, bbls.	lb.	.03¼	.03¾
Neutral, domestic, bbls.	lb.	.07¾	.08½
English, bbls.	**lb.**	**.08**	**.09**
German, bbls.	lb.	.07	.07½
Greases, choice white, bbl., N. Y.	lb.	.05	.06¼
Yellow	lb.	.04⅝	.04¾
Brown	lb.	.04½	.04⅝
House	lb.	.04⅝	.04¾
Herring, coast tanks	gal.	—	nom.
Horse, bbls.	lb.	.08¾	nom.
Lard, city tierces	lb.	.09½	—
Compound, tierces	lb.	.10¼	.10¾
Middle Western, tierces	lb.	.09⅞	—
Neutral, tierces	lb.	.11	nom.
Prime Western, tierces	lb.	.10	—
Lard oil, No. 1, bbls.	lb.	.09½	—
No. 2, bbls.	lb.	.09¼	—
Extra bbls.	lb.	.10	—
No. 1, bbls	lb.	.09¾	—
Winter strained, bbls.	lb.	.10½	—
Prime, bbls.	lb.	.12½	—
Linseed Oil, boiled, tanks	lb.	.1360	—
Car lots, bbls.	lb.	.1440	—
Less car lots, bbls.	lb.	.1480	—
Less than 5 bbls.	lb.	.1520	—
Double boiled, less than 5 bbls.	lb.	.1550	.1580
Raw, tanks	lb.	.1320	—
Car lots, bbls.	lb.	.1400	—
Less car lots, bbls.	lb.	.1440	—
Less than 5 bbls.	lb.	.1480	—
Refined, bbls.	lb.	.1470	.1510
Varnish grades, bbls.	lb.	.1490	.1530
Linseed cake, bags	ton	30.00	31.00
Meal, bags	ton	40.00	42.00
Menhaden, crude, tanks, Baltimore	gal.	.45	nom.
Light pressed, bbls.	gal.	.54	.56
Yellow bleached, bbls.	gal.	.56	.58
White bleached, bbls.	gal.	.59	.61
Mustard, bbls.	gal.	.90	—
Neatsfoot, cold pressed, bbls.	lb.	.16¾	—
Extra, bbls.	lb.	.10	—
No. 1, bbls.	lb.	.09¾	—
Pure, bbls.	lb.	.12	—
Oleo, No. 1, bbls.	lb.	.10⅛	—
No. 2, bbls.	lb.	.09⅝	—
Olive, denatured, bbls., N. Y.	gal.	.70	.75
Shipments	gal.	.70	—
Foots, bbls.	lb.	.06¼	.06½
Shipments	lb.	.06¼	—
Edible, bbls.	lb.	1.80	2.00
Palm, Lagos, casks, spot	lb.	.05½	.05¾
Shipments	lb.	.05¼	.05⅜
Niger, casks, spot	lb.	.05¼	.05½
Shipments	lb.	.05⅛	.05¼
Palm Kernel, pkgs.	lb.	.06¼	.06½
Tank cars	lb.	.06	—
Peanut, crude, bbls.	lb.	.09¼	.09⅜
Mills, tanks	lb.	.07¼	nom.
Refined, bbls.	lb.	.11¾	nom.
Perilla, bbl.	lb.	.12	.12¼
Poppy Seed, bbls.	gal.	1.70	—
Rapeseed, blown, bbls.	gal.	.76	.78
Refined, bbls	lb.	.65	.66
Red Oil, distilled bbls.	lb.	.09⅝	.10⅛
Tanks	lb.	.08¾	—
Saponified, bbls.	lb.	.09⅝	.10⅛
Tanks	lb.	.08¾	—
Salmon, coast, tanks	**gal.**	**.35**	**nom.**
Sardine, coast, tanks	gal.	.35	nom.
Sesame, refined, drums	lb.	.12	.12½
Soya Bean, blown, bbls	lb.	.11¾	12
Crude, bbls.	lb.	.10¾	.11
Orient, coast, tanks	lb.	.98½	.08¾
Sperm, bleached f.o.b., New Bedford, bbls.	**gal.**	**.84**	**.85**
Natural, f.o.b., New Bedford, bbls.	**gal.**	**.78**	**.80**
Stearic Acid, Double pressed, bags	lb.	.14	.14½
Triple pressed, bags	lb.	.16	.16½
Stearine oleo, bbls.	lb.	.08	.08¼
Tallow, edible, bbls.	lb.	.06	.06¼
City, extra, works, loose	lb.	.05	—
Special, works, loose	lb.	.04¾	—
Tallow, oil, acidless, bbls.	lb.	.09¼	—
Tanks, N. Y.	lb.	.09	—
Vegetable tallow, coast, mats	lb.	.06½	—
Whale, crude, No. 1, coast, tanks	**lb.**	**.07**	—
No. 2, coast, tanks	**lb.**	**.06½**	—
Refined, winter bleached, bbls.	**gal.**	**.80**	—
Extra, bbls.	**gal.**	**.82**	—
Natural, bbls	gal.	.78	—

Market Report on

FATS, OILS AND GREASES

(*As of July* 1, 1930)

NEW YORK—Oil, fat and grease prices continued their downward movement during the period just concluded, breaking through previous lows and in many cases reaching new low levels for recent years. Almost every item on the list was affected by the decline, and in no case was any advance in quotations noted. The abnormally large crops of all oil-bearing products during the past two seasons have resulted in an accumulation of supplies in the hands of users, who stocked up heavily at the attractive prices offered. Now with quotations at their lowest level, stocks are so heavy that additional purchases can be made only in small volume, this in turn keeping quotations down. Until the surplus is used up, prices must necessarily remain low, and a third year of heavy production will seriously embarrass some of the oil and fat producers.

Tallow registered a sharp decline as demand failed to equal current offerings. Grease, lard and stearine were also considerably under the quotations of last month. Stearic acid and red oil, which have resisted the decline for the past few months, finally weakened and were reduced fractionally during the recent period. Coconut oil and copra declined again, although the report is current in some quarters that arrivals in Manila are not as large as they should be at this season of the year. Another decline was noted in crude corn oil. New low prices for cottonseed oil this season were set during the period, but partial recoveries were made toward the close. Other items on the list which were quoted lower are chinawood oil, lard oil, menhaden oil, neatsfoot oil, palm oil, soya bean oil and tallow oil.

Chinawood Oil

This oil continued to decline, being quoted at 9c lb. in barrels at the close, ¾c lb. under the prices of a month ago. A new low record was set in silver during the period, this and the weakness in Chinese exchange being the important factors in the chinawood oil decline.

Coconut Oil

Copra and coconut oil continued to decline in spite of slightly stronger sentiment in the Manila market. Manila tanks were quoted at 6¼c lb. in New York, the lowest figure which has been quoted in this market for many years. Buyers continued to hold off in the hope of still lower prices.

Corn Oil

Another decline was noted in corn oil, mill tanks dropping from 7¾c to 7c lb., inside. There was little interest on the part of consumers even at the reduction. Reports from producers forecast a smaller crop this year in view of present low prices.

Cottonseed Oil

New low prices were set in cottonseed oil during the recent period, followed by slightly firmer sentiment toward the close. The government Spring pig report showed a decline of 6% in the United States pig crop as compared with last year, and reports on the progress of the cotton crop were pessimistic. This information was responsible for the more bullish sentiment shown late in the period.

Grease

Renewed competition among sellers, as a result of declines in tallow and other products, caused another drop in quotations on the greases, which declined to the lowest levels in recent years. House and yellow grease were offered at 4⅝c lb., inside.

Lard

With domestic and export trade quiet, and demand showing no improvement, lard quotations were reduced ½c to 1c lb., in step with the rest of the market. City tierces were quoted at 9½c lb., with compound at 10¼c. Middle Western tierces declined to 9⅞c lb., with prime Western tierces dropping to 10c.

Tallow

Additional offerings of tallow were made by producers at concessions all through the period, with the result that tallow dropped several times to reach 5c lb. for city extra and 4¾c for special. This set the pace for the rest of the market and led the decline.

OIL & FAT INDUSTRIES

The Editor's Page

Service to An Industry

IN THIS issue we publish the report of The Soap Analysis Committee of The American Oil Chemists' Society. We believe this to be a splendid example of the value to industry of co-operation between chemists. When the research chiefs of a dozen or more of the leaders in the soap industry are encouraged by their employers to devote considerable time and effort to standardization of analytical methods, it seems to us to evidence an attitude of helpfulness to the best interests of the industry which is far different from the feeling that prevailed with respect to such matters up until only a very few years ago. The American Oil Chemists' Society is blazing trails of service which may well be followed by many other groups of scientists.

Now — If Ever

The market prices of all varieties and grades of oils and fats have been scraping bottom now for several months. All those who have been accustomed to scan these markets have been for some time of the opinion that prices cannot go to lower levels and that an upturn is due in the near future. The net result of the present situation, however, should be of distinct advantage to all those who manufacture developed products, the raw materials for which consist of oils and fats, in whole or in part.

Margarine, mayonnaise, shortening and soap, commodities which are largely sold in small packages have not declined in price in proportion to the declines in the fatty raw materials which form the largest percentage of their composition. It is true that distribution costs may be slightly greater due to keener competition for business, but these increased distribution costs do not equal the reduction in production costs attributable to lower material prices.

The opportunities for profit in these lines at the present time is apparent. Manufacturers of specialties who give strict attention to cost analysis figures and take care to conserve for the profit account that additional margin which is theirs by reason of reduced material costs, should be able to show satisfactory profits at this time, if ever, because of these particularly favorable raw material prices.

It is easy, of course, for the careless producer to dissipate the advantage thus gained. Failure to take advantage of modern equipment and methods can make labor charges so high in comparison to those of competitors that competition becomes impossible. Ill-advised campaigns designed to force greater distribution than a given territory is capable of absorbing, or to invade areas where sales and distribution costs are prohibitive, due to unsuitable factory location, can quickly wipe out advantages due to cheaper raw materials.

In conclusion, however, we repeat, that the alert manufacturer of specialties from oils and fats should be accumulating satisfactory profits at this time, if ever, in spite of any influences of slackened demand.

Employes and Profits

MORE and more American manufacturers and business men in all lines are awakening to the fact that employes are something apart from, and must be treated differently than commodities. Surveys in various lines of business have shown that the lowest production costs are invariably recorded in those establishments which have the smallest labor turnover.

The industrialist of today realizes that the cost of training any employe, from the ordinary laborer to the most important executive, is such that it is of the greatest importance to keep personnel changes at a minimum. The production staff which is subject to frequent "lay-offs" in times of business depression, and to constant change

in membership at the whim of foremen or of management is undoubtedly the most expensive.

The problem of getting the most value in return for payroll expenditures seems to us to have been most successfully solved by The Procter & Gamble Company. Under the farsighted guidance of an experienced management, the production programs of the business have been so stabilized that every employe is guaranteed a minimum number of days work per year — furthermore, a high minimum. Under such condition, with the sinister fear of unemployment and loss of savings entirely removed from the picture, every employe must feel that he is an active member of a successful organization, and will consequently give of his best for the continuation of that organization's prosperity.

That the Procter & Gamble Company has further cemented the ties that bind their employes in loyalty by bonuses, profit-sharing and stock-purchase opportunities is well known. All such departures in employe relations would have seemed most radical fifty or sixty years ago when the company first initiated profit sharing plans, but today their outstanding success is bringing leaders in all industries to consider the adoption of identical methods in employe relations.

Not only is an employment policy of this type in keeping with modern ideas of sociology, but it is likewise mighty good business as the years have proven.

Canadian Linseed Oil

Eight establishments were manufacturing linseed oil in Canada during 1929, according to a report recently released by the Dominion Bureau of Statistics. Their total capital investment was $2,708,378, and 239 employees were engaged in the industry.

The annual output of raw linseed oil amounted to 3,295,255 imperial gallons, having a selling value at the mill of $2,637,581. The production of boiled linseed oil totaled 1,047,646 gallons, with a sales value at the mill of $837,070. The quantity of linseed oil available in Canada in the year (the total production of both grades of oil, namely, 4,342,901 gallons, plus the 1929 imports of 143,502 gallons) was 4,486,403 imperial gallons. Exports were 1,995 gallons during the year, and the apparent domestic consumption was 4,484,408 imperial gallons.

Shortening and Oil Prices

Prices of shortening and salad and cooking oils on Thursday, July 24, 1930, based on sales made by member companies of the Shortening and Oil Division of the National Cottonseed Products Association, were as follows:

Shortening

	Per lb.
North and Northeast:	
Carlots, 26,000 lbs.	@10½
3,500 lbs. and up	@10¾
Less than 3,500 lbs.	@11¼
Southeast:	
3,500 lbs.	@10¼
Less than 3,500 lbs.	@10¾
Southwest:	
Carlots, 26,000 lbs.	@10½
10,000 lbs. and up	@10½
Less than 10,000 lbs.	@10¾
Pacific Coast:	@11¼

Salad Oil

North and Northeast:	
Carlots, 26,000 lbs.	@10¼
5 bbls. and up	@10½
1 to 4 bbls.	@11¼
South:	
Carlots, 26,000 lbs.	@10
Less than carlots	@10¼
Pacific Coast:	@10½

Cooking Oil—White

⅛c per lb. less than salad oil.

Cooking Oil—Yellow

¼c per lb. less than salad oil.

Coconut planters of Jamaica recently decided to organize a co-operative association, the Jamaica Producers' Association, to improve the economic outlook of those engaged in the industry, which has been depressed for some time. The association will regard copra as the principal product and at least five drying plants will be established in various parts of the island.

The idea is to standardize Jamaica copra on the basis of the Malayan article. A factory for the production of oil from nuts will be established in Kingston. It is also proposed to turn out desiccated coconut, cattle fodder, and possibly soap.

A. C. Drury & Co. have been appointed Western Distributors for the Cherry Oil Co., manufacturers of cherry seed oil, which is suitable for use in cosmetics and high-grade salad dressings.

Stockholders of Jas. J. Kirk & Co., of Chicago, have approved the sale of the company's assets to the Procter & Gamble Co. Final details of the sale and the acquisition of the plant by the new owners will be completed in the near future.

Analytical Methods for Cottonseed

Report Covering the Methods Developed in Bureau of Chemistry and Soils for Sampling and Analysis

By GEORGE S. JAMIESON *and* ROBERT S. MCKINNEY

ABOUT a year ago a preliminary report was given by us (*Oil and Fat Industry*, 1929, VI, No. 7, p. 11) at the annual meeting of American Oil Chemists' Society. At that time, we gave the results of a detailed study of the various methods in use for the analysis of cottonseed for the purpose of determining its quality. Further study convinced us that all these methods contained one or more objectionable features. When the sample contained a large percentage of either slick or damaged seed, it was found that the methods in which a 10 gram portion was taken for analysis, seldom gave duplicate results and frequently the results showed a wide variation. Moreover, it is recognized that such small samples cannot represent aborted or immature seed, and the present practice of trying to evaluate such seed on a percentage basis is one that cannot be defended. Also, it is extremely doubtful whether samples of this size can be considered as representative when there are wide variations in the percentage of hull.

It is inconceivable that 90 or 100 seeds, more or less consciously picked from a specimen of seed of doubtful authenticity, may represent, in all of its probable variables, the two hundred millions of cottonseed contained in a carlot of 25 tons. On the other hand a series of very carefully conducted tests has demonstrated the fact that the limit of reduction of a sample of cottonseed in its natural form is between 50 and 60 grams. The gram portion of seed used in the Official Method is, therefore, sufficiently large to be representative of the sample provided it is properly obtained. Mr. Meloy has devised a machine for the purpose of accurately subdividing the laboratory sample into representative portions and thereby has largely removed the personal element from this phase of cottonseed analysis.

It was found that the quantity of oil extracted in the usual manner varied considerably, owing to the fact that different laboratories grind the seed to different degrees of fineness. However, it was repeatedly observed that the laboratories which grind their samples to approximately the same degree of fineness consistently checked each other's results with the same samples of seed. By using a properly adjusted Bauer mill and following in detail the directions given in our method, this source of error can be avoided.

After giving careful consideration to all the various procedures that have been proposed and to the criticisms and suggestions of various members of the American Oil Chemists' Society, all of which were much appreciated, we finally chose the Official Method as a working basis both on account of the size of the portions of seed taken for analysis and the possible elimination, insofar as that is possible, of the personal element in the analysis. You will find the method to be quite similar to your Official Procedure, but it differs in the following respects: The 60 gram portion of seed is dried for two hours at 130° previous to the treatment with hydrochloric acid. Instead of directing that the seed be ground fine enough to pass through a 30 mesh sieve, which has been a source of considerable criticism on account of the difficulty of actually meeting this requirement, it is recommended that the seed be ground as fine as possible in a Bauer Laboratory mill, so that after mixing the ground sample has a homogeneous appearance. Although the ground sample may appear to be homogeneous, it may not actually be so. Consequently, it is necessary to follow the directions for getting representative portions of the ground sample for the several determinations. Furthermore, as it is not practical to direct that the seed be ground to a definite degree of fineness, in the determination of oil, after the first extraction, the material is to be reground in a mortar and extracted a second time.

Our method has been applied to the analysis of many regular daily mill samples, which

were kindly sent from a mill at which the yield of crude oil checked very closely with that estimated by the chemist from his analyses. Being familiar with the method employed, we know that it would give correct average figures. As expected, the results which we obtained by our method closely checked the average results reported to us. For example, we obtained an average of 21.89 per cent of oil on the dry basis, whereas the mill reported 21.81 per cent, for a set of 20 samples of seed.

Samples of cottonseed were carefully subdivided by quartering, and representative portions sent to a commercial chemist who uses the present Official Method in his laboratory. His average results checked ours very closely. For example, on a set of 13 samples he obtained an average of 21.83 per cent of oil, and we obtained 21.90 per cent of oil.

The advantages of our method are: A large sample is taken to be representative, even if the sample contains damaged, slick, aborted or immature seed. The moisture of the seed does not influence the results. The fuming of the seed does not result in a predicted oil content of the cottonseed higher than can be obtained in plant practice. The grinding of the sample does not affect the results of the analyses.

Our methods include those for the determination of moisture, free fatty acids, oil and ammonia. It is believed that when the sampling and the analyses of cottonseed are actually made according to the methods recommended by Mr. Meloy and ourselves, results will be obtained which will indicate accurately the quality of the seed. It is expected that upon further study some additional details may be added to the methods presented here today.

The committee appointed at the request of your industry has spent about a year and a half studying methods for the sampling and analysis of cottonseed, and it is now recommended that the selected methods be considered with a view to their adoption by the National Cottonseed Products Association.

The Methods in Detail

Laboratory Sample

THE sample received at the laboratory shall consist of approximately 1,000 grams of cleaned seed. It shall be sealed in an air-tight container and shall be accompanied with a statement as to the original weight and that of the separated foreign matter.

Quartering of Samp'e

THE sample shall be examined by the chemist, who, if it is not thoroughly cleaned, shall correct the weights reported to him by the sampler, for such additional foreign matter as he may find in the sample. The cleaned sample should be quartered and one half of it returned to the original can and retained as a referee sample. The second half shall be preserved in an air-tight container and used by the chemist for his analysis. The sample to be used for the analysis shall be quartered down until the combining of opposite quadrants yields two samples of about 120 grams. One of these shall be used for the free fatty acid determination. The second half is requartered, yielding two samples of 60 g. One of these is used for the moisture determination and the other for oil and ammonia determinations.

Quartering shall be done as follows: Place the sample on a large piece of paper and mix thoroughly, passing the hands upward through the pile and separating any masses of seed with the fingers. Particularly, if there is a large percentage of damaged seed present, the greatest care should be exercised to get the seed well mixed. If a large amount of bald seed is present they tend to segregate to the bottom of the pile. In such cases, it is preferable to remove the bald seeds, and later distribute them uniformly over the thoroughly mixed flattened pile of fuzzy seed. Divide into four equal parts by cutting twice through the pile to the bottom in the usual manner through the center at right angles to each other. This can well be accomplished with a large spatula. Quadrants No. 1 and No. 3 are discarded, while quadrants No. 2 and No. 4 are combined, mixed and requartered. Or the sample shall be mixed and quartered by such mechanical means as is approved by the Chemists' Committee.

Original Moisture

DETERMINATION.—Carefully crack each seed coat by means of an approved laboratory crimper. Weigh duplicate samples of about 5 grams into official aluminum dishes (2 inches diameter and ¾ inch high, fitted with cover). Dry for 5 hours at 101° C. in A. O. C. S. Official Jacketed Oven, or Dr. Khotinsky Constant Temperature Oven. (Any other make of electric oven that can be shown to give as uniform a temperature throughout as the ovens specified, may also be used.) The cover is then placed on the dish and the dish placed in an efficient desiccator until cool (one-half hour). The sample is reweighed and loss in weight calculated as moisture.

DETERMINATION.—Optional Method. The sample of about 60 grams resulting from quartering is weighed into an aluminum dish with cover (of about 9 cubic inches capacity) cap-

able of holding sample. The sample in the moisture dish with lid removed, is placed in the drying oven at 101° C. to 102° C. for 10-14 hours or over night. The cover is then placed on the dish and the dish placed in an efficient desiccator until cool (one-half hour). The sample is reweighed and loss in weight calculated as moisture.

DETERMINATION.—Optional Method. Weigh into official moisture dish, as rapidly as possible to avoid moisture change, between 5 and 10 grams of the whole seed, the exact weight being recorded. The uncovered dish containing the sample is placed in the oven at 102° for from 10 to 14 hours, or most conveniently over night. The dish when removed from the oven is covered, cooled in an efficient desiccator (one-half hour) and weighed, the loss in weight being calculated as moisture.

Fuming and Grinding

APPARATUS.—1. *De Khotinsky Constant Temperature Oven.*

2. *Fuming Oven.*—A well ventilated oven capable of reaching and maintaining a temperature of 125° C., the variations from this temperature being not more than 5° C. in any part of the oven.

3. *Fuming Pots.*—A porous earthenware vessel, such as a 3 inch flower pot.

4. *Grinding Mill.*—Bauer Bros. No. 148 Laboratory Mill, using No. 6912 plate.

PROCESS.—Dry the sample of about 60 grams for two hours at 130° C. ‡1°. Absorb into the inner walls and bottom of the flower pot 1.5 cc. of concentrated hydrochloric acid. The acid is distributed all over the side of the pot and when absorbed, the inside of the pot must appear dry, otherwise a new pot must be substituted. Place the dried seed in the pot, cover with a watch glass and place in the fuming oven at 125° C. for 1 hour. The lint should be loose and brittle, not scorched. Grind the sample in Bauer Mill which has been adjusted to produce a fine meal. After grinding, open up the mill and carefully brush out all remaining ground seed onto a sizable smooth sheet of paper. It is important that the top of the hopper of the Bauer mill be fitted with a cover to prevent loss of seed during grinding. There should be practically no loss of material in grinding and if more than 1 gram of material is lost the whole process should be repeated as the lost material is not necessarily representative of the whole.

Mix ground sample thoroughly. It is recommended that this be done by placing in a one-half gallon Mason fruit jar, containing a large rubber stopper. Replace the cover and shake violently for three minutes, then transfer to a well stoppered bottle or container.

Second Moisture

DETERMINATION.—Weigh 5 grams of ground sample into moisture dish and dry at 101° C. for 3 hours. Place cover on dish, cool in desiccator (one-half hour) and reweigh. Calculate loss in weight as per cent of moisture of fumed sample.

Oil

APPARATUS.—Extraction apparatus of Butt or other continuous percolation type. The use of Allihn condensers with 12 inch jackets, fitted with cork connections is recommended.

DETERMINATION.—Weigh accurately duplicate samples of 4 to 5 grams, wrap in a 125 or 150 mm. filter paper (S & S No. 597, or equivalent grade) and rewrap in a second paper or papers in such manner as to prevent escape of the meal, leaving the top of the second paper open like a thimble. Place a piece of absorbent cotton in the top of the thimble to distribute the dropping ether. Place 25 cc. of petrolic ether (see Specifications Rule 272, Sec. 3) in a tared flask of 50 cc. or of 120 cc. capacity and extract sample for 2 hours. The ether should drop on the center of the thimble at a rate of at least 150 drops per minute. The volume of the solvent should be kept approximately constant. Regrind the sample in a mortar, rewrap in the filter papers as before and re-extract for one hour. The solvent is evaporated off until no trace remains, the sample cooled to room temperature, and weighed. The last traces of ether are sometimes difficult to detect by odor and in case of doubt evaporate for an hour or longer until constant weight is obtained.

Example of Calculation

Petrolic Ether Extract	1.0255	grams
Original Moisture	12.22	per cent
Second Moisture	2.54	per cent

$$\text{Per cent oil} = \frac{1.0255}{5} \times \frac{87.78}{97.46} = 18.45$$

Nitrogen

Nitrogen to be made as per Rule 272, Sec. 5.

Free Fatty Acid

DETERMINATION.—Heat about 120 g. of seed, obtained by quartering, for 30-40 minutes at a temperature of 100-5° and cool. Separate the meats by any laboratory huller or mill that will approximate factory conditions and grind sufficiently to pass a 1.5 mm. sieve. At least 20 g. of meats should be obtained. Extract the thoroughly mixed meats by cold percolation with petrolic ether. The following procedure is recommended. Place the lower disc from a Knorr Extraction Apparatus in a Butt

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California Olive Oil Studies

*Proposing Tests and Standards for Quality Control of a Valuable Domestic Edible Oil Product**

By P. F. NICHOLS[1] *and* B. E. LESLEY[2]

WHILE tests and standards for the purity of all oils of commerce are well established and generally reliable, tests for quality have not found so nearly universal acceptance. Particularly is this true in the case of California olive oils, for which the time-honored and the only test for quality of an exact, impersonal, laboratory nature is that of free fatty acid content. The tasting test for flavor and rancidity is of course of great value and gives at least reasonably consistent comparisons when applied by experts. No difficulty should be experienced with this test in distinguishing between oils that are perfectly satisfactory and those that are distinctly bad or off-flavor. Nevertheless the test is so largely a matter of personal taste and judgment that gradations in quality cannot be exactly defined and it is impossible to establish by its means standards that can be rigidly adhered to by all persons. For this reason it permits a great deal of difference of opinion as to intermediate grades and fine distinctions.

An important factor in quality in olive oil is the relative freedom from rancidity. It is known that the free fatty acid content of oil is not a direct measure of rancidity, since rancid flavors and odors may remain after all free acid has been neutralized. The use of the free fatty acid determination as an index of rancidity is likely to be very misleading, therefore, particularly if the oil has undergone any sort of refining. This fact has been realized by investigators in the past, and several laboratory tests for rancidity have been proposed ([1,2,3,4]).

Other factors in quality are the color, which in several other oils is determined by the Lovibond tintometer and color glasses, and the "body" which appears to be measurable by various tests for viscosity.

These tests have been applied by the writers to oils kindly furnished and described by California olive oil manufacturers, to California and imported olive oils bought on the open market, and to a few olive oil substitutes also bought on the open market. While the work so accomplished certainly does not warrant the adoption by the industry, or perhaps even the recommendation to the industry of standards at this time, the results are of interest in that they point out certain possibilities which could be tried out in a preliminary way now, if desired, and they also show some of the difficulties yet to be overcome.

Description of the Tests

THE tests used, described briefly, are as follows:

1. Color was determined by use of a tintometer designed by one of the writers (P. F. N.) in which the color of a standard depth of oil (5¼") in a flat-bottomed clear glass tube illuminated by a transmitted white light was matched by the interposition of standard yellow, red and blue Lovibond color glasses over a similar depth of distilled water illuminated in the same manner.

2. Relative viscosity was determined by observing the time in seconds required for a standard pipet held in a stationary vertical position to discharge the amount of oil contained between two marks on the stem respectively above and below the bulb. This number of seconds, corrected for temperature to 20 deg. C., was divided by the number of seconds required for the similar discharge of distilled water at 20 deg., and the quotient used as an index of relative viscosity.

3. Free fatty acid was determined as per cent oleic acid by bringing to boil, with shaking, approximately 20 grams of oil mixed with 50 c.c. of neutralized 95 per cent ethyl alcohol, and titrating with N/10 Na OH, using phenolphthalein as an indicator.

4. The Kreis test (1) was performed by shaking approximately 10 c.c. of oil with a similar amount of concentrated HCl, shaking for 30 seconds in a large, rubber-stoppered test tube, and adding 10 c.c. of 0.1% solution of phloroglucin and shaking again. A red color

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* *Contribution from Fruit Products Laboratory, University of California.*

[1] Associate in Fruit Products.

[2] Formerly Assistant in Fruit Products.

developing on addition of the phloroglucin solution was considered positive, and gradations in the intensity of the test are shown in the Table 1 with the other tests.

5. The Issoglio test was run in two ways, namely, the oxidation following the digestion recommended by R. H. Kerr[1] and the oxidation following steam distillation as recommended by Issoglio[2].

6. The von Fellenberg test was run by adding to approximately 1 c.c. of oil about 1 c.c. petroleum ether and ½ c.c. Fuchsin sulfurous acid reagent as recommended by von Fellenberg[3]. An immediate blue color was considered as positive, the gradations in rate of color appearance being classified as shown in Table 1.

7. The Vintilesco and Popescu test was run by mixing 10 gms. oil with 4 to 5 drops of defibrinated horse blood, 10 drops of tincture of guaiac, and 10 c.c. hydrogen peroxide as recommended by Vintilesco and Popescu[4]. A blue color was considered as positive, the gradations in intensity being classified as shown in Table 1.

Results Obtained

THE results of these tests are summarized in Table 2, in which are shown the types and number of samples studied, together with averages, maxima, and minima.

TABLE I

Test	Kreis	Von Fellenberg	Vintilesco and Popescu
Positive	+ + + = 7	+ + + = 5	
	∴ + = 6	∴ + = 4	+ + = 4
	+ = 5	+ = 3	+ = 3
Doubtful	+ (pink) = 4	+ (weak) = 2	+ (weak) = 2
	—(orange) = 3		
Negative	— = 2	— = 1	— = 1
Negative	— — = 1		

TABLE II

	Color—Lovibond Y	R	B	Relative Viscosity	Free Fatty Acid	Kreis Test	Issoglio Number Digestion	Distillation	von Fellenberg Test	Vintilescu and Popescu Test
						21 California Olive oils—Edible				
Ave.	80.8	4.8	2.0	15.5	1.00	— Orange to —	16.4	7.0	+ (weak +	+ (weak) to +
Max.	90.	17.5	6.7	16.4	6.24	+	42.0	14.2	+ +	+ +
Min.	60.	.5	—	14.5	0.16	— —	5.4	2.7	—	—
						4 California Olive oils—Doubtful				
Ave.	86.7	2.6	1.3	15.7	1.48	+ (pink)	9.7	5.1	+	+
Max.	90.	3.2	2.0	16.4	4.30	+ +	22.4	7.5	+ +	+ +
Min.	85.	1.3	0.0	15.2	0.23	— (orange)	2.9	2.7	+ (weak)	+ (weak)
						9 California Olive oils—Technical				
Ave.	87.	5.1	8.6	16.3	3.85	+ +	16.2	8.2	+ to + +	+ to + +
Max.	90.	10.0	15.0	17.2	7.38	+ + +	21.1	10.2	+ + +	+ +
Min.	85.	2.3	0.0	15.9	0.90	— (orange)	8.3	5.3	—	—
						4 Imported Olive oils—Edible				
Ave.	62.5	2.5	.5	15.7	.83	—	9.7	6.3	+ (weak) to +	+ (weak)
Max.	75.	4.3	1.5	16.1	1.83	+ (pink)	10.6	8.0	+	+ +
Min.	40.	.5	—	15.1	.40	— —	8.6	5.3	+ (weak)	—
						2 Olive Oil Substitutes				
Ave.	37.5	2.2	—	14.1	.06	+ (pink)	5.8	6.6	+ (weak) to —	—
Max.	60.	3.5	—	14.4	.09	+ +	8.0	8.4	+ (weak)	—
Min.	15.	1.0	—	13.8	0.3	—	3.5	4.9	—	—

Summary

FROM Table 2 it is seen that, in the samples studied, color was lowest in olive oil substitutes, then in imported oils, then in California edible, doubtful, and technical oils respectively.

Viscosity was lowest in olive oil substitutes, highest in California technical oils, and medium in all the rest. Imported oils appeared to have the same "body" as California edible oils.

Free fatty acid was lowest in substitute oils, and next lowest in imported olive oils.

With respect to the Kreis, Issoglio, von Fellenberg, and Vintilesco and Popescu tests for rancidity, the latter two tests appear unreliable. The Issoglio test, using the digestion method, seems to give too high results especially with unwashed oils; using the distillation method it gives too low results and fails to distinguish bad oils. The Kreis test appears to give reliable results more closely correlated with rancidity than do any of the others, but occasionally fails to distinguish bad oils or condemns good oils.

Conclusions and Recommendations

IT APPEARS from the study here reported that, on the average, California olive oil has very similar characteristics of color, relative viscosity, and free fatty acid to those of the imported olive oils some of which command a premium in price. The deviations from the average, however, are greater.

As an aid to the development of greater uniformity, therefore, it is recommended: first,

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Oil Chemists' Committee Assignments

President Irwin Announces Appointments to Various Groups for Conduct of Society's Work during coming Year

W. H. IRWIN, of Chicago, President of The American Oil Chemists' Society, announces the appointment of the following Committees of the Society to function during the 1930-1931 year. President Irwin has given most careful consideration to the selection of membership for the various Committees, with a view to promoting the progress of the Society's work by having each Committee composed of members actively interested in that phase of work which is under the jurisdiction of that Committee, and by having the Chairmanship of each Committee in the hands of a capable member who is willing to devote serious effort to the furtherance of this Committee's work.

The Soap Section Committees have not been announced to date, but notice of their membership will be published in early issues of *Oil & Fat Industries* and of *Soap*, the Official Organ of the Soap Section. In selecting the Soap Section Committees, President Irwin is having the co-operation of Archibald Campbell, Chairman of the Soap Section and Vice-President of the Society.

The full list of the Society's general Committees, as announced to date by President Irwin, is as follows:

Uniform Methods and Planning Committee

J. J. Vollertsen, Armour & Co., U. S. Yards, Chicago, Ill., (Chairman); A. Campbell, 3239 Stettinius Ave., Cincinnati, Ohio; N. C. Hamner, Southwestern Laboratories, 1812½ Main St., Dallas, Texas; C. B. Cluff, The Procter & Gamble Company, Ivorydale, Ohio; E. T. Marceau, Gold Dust Corporation, 297 Fourth Ave. at 23rd St., New York, N. Y.

Color Committee

W. D. Hutchins, The Southern Cotton Oil Co., Savannah, Ga., (Chairman); A. K. Schwartz, South Texas Cotton Oil Co., Houston, Texas; G. G. Grant, Durkee Famous Foods, Inc., 2670 Elston Ave., Chicago; G. W. Agee, Barrow-Agee Laboratories, Memphis, Tenn.; A. W. Putland, Armour & Company, U. S. Yards, Chicago, Ill.; T. C. Law, Law & Company, Atlanta, Georgia.

Olive Oil Committee

M. F. Lauro, Bureau of Chemistry, New York Produce Exchange, New York, N. Y., (Chairman); M. L. Sheely, Armour Soap Works, 1355 W. 31st St., Chicago, Ill.; S. Musher, 200 N. Kresson St., Baltimore, Md.; W. H. Dickhart, Bureau of Chemistry, New York Produce Exchange, New York, N. Y.; G. S. Jamieson, Bureau of Chemistry, Oil, Fat & Wax Laboratory, U. S. Dept. of Agriculture, Washington, D. C.; A. H. Gill, Massachusetts Institute of Technology, Cambridge, Mass.; H. E. Corman, Harris Abattoir Co., Toronto, Ontario, Canada.

Smalley Foundation Committee

A. W. Putland, Armour & Co., U. S. Yards, Chicago, Ill., (Chairman); G. W. Agee, Barrow-Agee Laboratories, Memphis, Tenn.; H. C. Moore, Armour Fertz. Wks., 111 W. Jackson Blvd., Chicago, Ill.; C. A. Butt, International Agricultural Corp., P. O. Box 1725, East Point, Georgia; L. B. Forbes, L. B. Forbes Laboratories, Little Rock, Arkansas; N. C. Hamner, Southwestern Laboratory, 1812½ Main St., Dallas, Texas; L. C. Haskell, Southern Cotton Oil Co., Savannah, Georgia; G. K. Witmar, The Battle Laboratory, Montgomery, Alabama.

Moisture Committee

N. C. Hamner, Southwestern Laboratories, Dallas, Texas, (Chairman); A. E. King, Swift & Company, Chicago, Ill.; J. D. Evans, Law & Company, Atlanta, Georgia; E. H. Tenent, L. B. Forbes Laboratories, Little Rock, Arkansas; W. C. Moor, Armour & Company, Fort Worth, Texas.

Kreis Test Committee

A. S. Richardson, The Procter & Gamble Co., Ivorydale, Ohio, (Chairman); L. M. Tolman, Wilson & Company, U. S. Yards, Chicago, Ill.; W. D. Hutchins, The Southern Cotton Oil Company, Savannah, Georgia; A. K. Epstein, Epstein Reynolds & Harris, 5 S. Wabash Ave., Chicago; W. D. Richardson, Swift & Company, U. S. Yards, Chicago, Ill.; D. M. Gray, Hazel-Atlas Glass Company,

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Soap Section Committee Report

American Oil Chemists' Society, New Orleans, La., May 9, 1930
Presented Before Twenty-first Annual Convention

By A. K. CHURCH, *Chairman*

DURING the year the committee has completed its work on the analysis of the A. O. C. S. crude glycerin standard sample. The accepted analysis reflects accurately, we believe, within the limits of the method, the correct analysis of this sample when carried out by the International Acetin Method for crude glycerin adopted 1911. Never before has there been available in the United States a crude glycerin sample of authenticated analysis. The committee feels that such a sample will be found of value to all laboratories engaged in glycerin work. This A. O. C. S. standard crude glycerin sample is for sale by J. C. P. Helm, Sec., A. O. C. S., 705 Tchoupitoulas St., New Orleans, La., at one dollar a four-ounce bottle. The complete analysis is printed on the label. A detailed report of the committee's work on this sample appeared in *"Oil & Fat Industries,"* Dec., 1929.

The Soap Section Committee recommends that in the printed standard methods of the A. O. C. S. reference be made to the IAM for crude glycerin as the method for crude glycerin analysis adopted by our Society.

Standardization of the Acid Reagent

IN CONNECTION with work on the crude glycerin sample, methods of standardization of the acid reagent used were discussed at considerable length, two methods being presented in detail in the report of the committee's work published in *Oil & Fat Industries,* Dec., 1929. It is the consensus of opinion of the members that explicit directions for standardizing the acid are inadvisable for the reason that qualified chemists know how to prepare standard acids accurately—if they do not, they are not competent to carry through the Acetin Method. Also the I. S. M. Committee of 1911 did not consider it necessary to recommend a standard method.

On the other hand a minority opinion has been expressed that it is generally admitted that identical and specific procedures tend towards closer checks between different laboratories and encourage more careful and accurate work in all laboratories. That this is the age of standardization in all things and especially in methods of physical and chemical tests. That if it be desirable, for example, to recommend a standard method for the simple operation of determining the free fatty acids in an oil, it would seem decidedly more desirable and important to recommend a specific method of preparing the standard acid used in the free fatty acid determination, since the correctness of the FFA determination depends primarily on the correctness of the standardization of the acid.

A specific method for standardizing acid employed in oil, soap, and glycerin analysis, using the A. O. C. S. standard sodium carbonate now available and of which there is an ample supply, might be worth considering by the Uniform Methods Committee.

The laboratories that sent in results on the soap follow: (The laboratories are not listed in the order of the analyses.)

Fels & Co., Philadelphia, Pa.; La France Mfg. Co., Philadelphia, Pa.; Lever Brothers Co., Cambridge, Mass.; Lever Brothers, Ltd., Toronto, Canada; Larkin Co., Inc., Buffalo, N. Y.; Kirkman & Son, Brooklyn, N. Y.; Dr. Foster D. Snell, Brooklyn, N. Y.; Swift & Co., Chicago, Ill.; Mellon Institute, Univ. of Pittsburgh, Pittsburgh, Pa.; Curtis & Tompkins, San Francisco, Cal.; Procter & Gamble, Ivorydale, Ohio; The Palmolive Co., Milwaukee, Wis.; Colgate-Palmolive-Peet Co., Berkeley, Cal.; Los Angeles Soap Co., Los Angeles, Cal.

The standard methods for the analysis of soap adopted by the American Chemical Society and approved by our own Society, were employed in this work. The results are, in respect to some items, in your chairman's opinion, unsatisfactory. Mr. Peterson, Sec. of the Soap Section, comments, in part, as follows:—

Soap Sample

FOURTEEN laboratories submitted analyses of the soap sample, one laboratory sending two, each by a different analyst, making fifteen results received. The analyses follow:

A. O. C. S. Standard Soap Sample Calculated to Dry Basis

	1	2	3	4	5
Per Cent Fatty Anhydrides	85.68	85.94	86.10	86.03	86.45
Per Cent Fatty Anhydrides	10.07	10.01	10.11	10.07	10.095
Per Cent Combined Alkali (Na_2O)	0.92	0.15	0.60	0.74	0.312
Per Cent Combined Alkali (Na_2O)	0.67	0.93	Nil	N.F.	0.01
	87.27	87.02	86.70	86.77	86.772
Per Cent Glycerol	0.32	0.35	0.38	0.405	0.415
Per Cent Free Caustic Soda (NA_2O)	Nil	Trace	Nil	Nil	Trace
Per Cent Free Fatty Acids as Oleic	Nil	None	Nil	Nil	None
Per Cent Silica (SiO_2)	1.36	1.37	1.48	1.46	1.551
Per Cent Carbon Dioxide in IIA	0.21	0.22	0.21	0.061	0.091
Per Cent Total Alkalinity of Matter Insoluble in Alcohol calc. as Na_2O	0.77	0.82	0.81	0.88	0.83
Per Cent Sulphates calc. as Sodium Sulphate (Na_2SO_4)	Nil	0.04	0.03	0.009	0.04
Per Cent Chlorides calc. as Sodium Chloride (NaCl)	0.22	0.20	0.27	0.223	0.283
	100.22	100.03	99.99	99.878	100.077
Constants of Total Fatty Acids including unsaponified and unsaponifiable:					
Titre	40.4	40.48	40.45	40.4	39.90
Saponification Value	207.2	206.55	203.7	204.7	204.75
Iodine Number	59.8	60.60	60.1	59.86	57.77

	10	11	12	13	14	Ave.
Per Cent Fatty Anhydrides	86.38	86.04	86.15	86.30	85.80	85.29
Per Cent Combined Alkali (Na_2O)	10.07	11.01	9.93	10.11	10.22	10.13
Per Cent Unsaponifiable Matter	0.46	0.19	0.15	0.18	0.43	0.44
Per Cent Unsaponified Fat	0.01	0.10	0.15	0.28	0.57	0.20
	86.85	86.33	86.45	86.76	86.80	86.93
Per Cent Glycerol	0.38	0.336	0.33	0.43	0.25	0.35
Per Cent Free Caustic Soda (NA_2O)	Nil	0.05	Trace	Nil	0.062	Trace
Per Cent Free Fatty Acids as Oleic	Nil	Nil	Nil	Nil	Nil	Nil
Per Cent Silica (SiO_2)	1.56	1.482	1.66	1.44	1.40	1.39
Per Cent Carbon Dioxide in IIA	0.075	Trace	0.06	0.23	—	0.136
Per Cent Total Alkalinity of Matter Insoluble in Alcohol calc. as Na_2O	0.81	0.421	0.73	0.75	0.720	0.780
Per Cent Sulphates calc. as Sodium Sulphate (Na_2SO_4)	0.039	0.049	0.025	0.06	0.04	0.026
Per Cent Chlorides calc. as Sodium Chloride (NaCl)	0.25	0.214	0.26	0.27	0.21	0.246
	100.034	99.892	99.445	100.05	99.702	99.938
Constants of Total Fatty Acids including unsaponified and unsaponifiable:						
Titre	40.30	40.75	40.20	40.0	39.00	40.21
Saponification Value	204.77	199.95	203.4	200.9	204.30	203.95
Iodine Number	59.48	60.74	—	55.5	63.80	59.65

Standard Soap Sample Calculated to Dry Basis

	6	7	7a	8	9
Per Cent Unsaponifiable Matter	87.10	86.31	86.22	87.48	86.40
Per Cent Unsaponifiable Matter	10.04	10.00	10.03	10.17	10.08
Per Cent Unsaponified Fat	0.78	0.41	0.61	0.21	0.44
Per Cent Unsaponified Fat	Nil	Nil	Nil	0.22	0.02
	87.88	86.72	86.83	87.91	86.86
Per Cent Glycerol	0.37	0.32	0.35	0.24	0.35
Per Cent Free Caustic Soda (NA_2O)	0.009	0.02	.017	None	Nil
Per Cent Free Fatty Acids as Oleic	Nil	Nil	Nil	None	Nil
Per Cent Silica (SiO_2)	1.28	1.46	1.37	0.48	1.52
Per Cent Carbon Dioxide in IIA	—	0.34	0.31	0.17	0.072
Per Cent Total Alkalinity of Matter Insoluble in Alcohol calc. as Na_2O	0.92	0.87	0.83	0.75	0.80
Per Cent Sulphates calc. as Sodium Sulphate (Na_2SO_4)	Nil	0.009	.010	None	0.041
Per Cent Chlorides calc. as Sodium Chloride (NaCl)	0.25	0.20	0.23	0.35	0.26
	100.749	99.939	99.977	99.97	99.983
Constants of Total Fatty Acids including unsaponified and unsaponifiable:					
Titre	40.2	40.5	40.4	40.55	39.75
Saponification Value	200.85	204.9	204.8	203.80	204.90
Iodine Number	—	60.7	60.4	59.50	57.20

"x x x the results are far from satisfactory with respect to agreement in some of the individual items, while in others the agreement seems to be fairly close. Would this not seem to indicate that the methods of some of these items are at fault?

"It seems to me that the laboratories who have worked on this sample are capable of close agreement where the methods in use are capable of producing checking results. This is borne out by the work on the glycerin sample where very good agreement was obtained."

The chairman feels that improvement of the present standard method for determining the unsaponifiable matter and the unsaponified fat in soap is indicated as desirable by the above results.

Standardization of Reagents for the International Acctin Method for Crude Glycerin

DURING the course of our work on the crude sample your chairman's attention was called by a committee member to the fact that if the true glycerol, organic residue, and ash figures of the accepted analysis were added together, and the moisture determined and added thereto, instead of totaling approximately 100 the sum amounted to only about 98.5% showing about 1.5% unaccounted for. This discrepancy was confirmed in the chairman's laboratory on the determination of the water in our standard crude glycerin sample. Then a sample of C. P. glycerin certified to by the British Executive Committee (see below) and employed in England for the standardization of reagents used in the International Standard Methods for crude glycerin was procured. Its specific gravity was determined; also the total acetylizable as glycerol by the Acetin Method; also the glycerol by the bichromate method. The percent of glycerol from the sp. gr., using the Bosart & Snoddy tables, was 90.40; by the Acetin Method 88.86%. Here again is an unaccounted for difference of about 1.5%. The percent of glycerol by the bichromate method was 90.39 confirming the results from the sp. gr. tables.

Throughout the world crude glycerin is bought and sold on the International Acetin Method analysis. In the United States, we have thus far stuck to the use of a standard acid as the control agent, as originally specified by the International Committee in 1911. In Great Britain, however, the British Executive Committee under date of January, 1914, in "Supplement No. 1 (I. S. M. 1911)" in respect of the "Standardisation of Re-Agents" recommend that "The final standardisation is to be carried out upon Chemically Pure Glycerin in which the water content has been accurately determined." Chemically Pure Glycerin of standard quality is supplied bearing the seal and label of the British Executive Committee.

At the time the unaccounted for loss by the Acetin Method was brought to your chairman's attention he was not acquainted with the action of the British Committee in 1914 in adopting the use of C. P. Glycerin for standardizing the re-agents used in the Acetin Method. He has since been informed that the reason for this action by the English chemists in 1914 was the unaccountable loss noticed by them when using the Acetin Method as promulgated in 1911. So it would appear that we have rediscovered this same unaccounted for loss not realizing that it had already been discovered and action taken upon it by our English brothers.

This unaccounted for loss by the Acetin Method is now before the Soap Section Committee for their consideration. Some members have expressed the opinion that the Acetin Method is simply a measure of the OH groups whether these be present as glycerol or other compounds. Therefore, how can any sample of C. P. Glycerin be selected for standardization purposes with the assurance that it is absolutely definite in its glycerol content inasmuch as there may be other OH groups present? Again, since the Acetin Method is used as a standard for glycerol in buying and selling, the question whether it gives a true glycerol content or not is not important commercially but only of academic interest. The question, therefore, seems to be, so some of the committee have expressed themselves, whether the Committee as a whole would be sufficiently interested in an academic problem to spend much time on it.

On the other hand, other members have expressed a desire to investigate this apparent discrepancy; and most of the laboratories have indicated a willingness to work on this problem to the extent their facilities and time permit. Your chairman is one of those who cannot feel comfortable until this unaccounted for loss shown by the Acetin Method, when using standard acid as the controlling re-agent, is explained, or, if not explained, rectified.

The chairman and secretary wish to thank each member of the committee and each cooperating laboratory for the work done and the fine spirit of co-operation manifested.

(*Turn to page* 315)

A New Method for the Determination of Neutral Fat in Sulphonated Oils*

By Ralph Hart

IN A paper by the writer on the "Determination of Neutral Fat in Sulphonated (sulfated) Oils,"[1] it was suggested that instead of finding the neutral fat gravimetrically, the determination of the saponification number corresponding to the neutral fat might be sufficient. Since then Nishizawa and Winkuti[2] have investigated the effect of alkali on sulfonated oils and find that boiling for five hours with 1.oN alcoholic caustic has only a negligible effect on the sulfate radical. Hence, saponification tests on sulfonated oils may be carried out without fear of interference from the organically combined sulfate group. Herbig[3] also has made saponification tests on the neutral fat extracted from sulfonated castor oil by means of cold acetone—a method developed by himself.

While the present A.L.C.A. method for the analysis of sulfonated oils are quite complete, it would seem desirable to include the saponification test outlined below; which by calculation would furnish the following additional information; (1) the saponification value of total fatty matter—useful in identifying the origin of the sample, (2) saponification equivalent of neutral fat, and (3) the approximate percentage of neutral fat.

In this discussion the following terms will be employed:

(a) "Fatty Matter" — animal or vegetable oils, fats and waxes which react with alkali.

(b) "Unsaponifiable Oil or Grease" — mineral oil and waxes not affected by alkali.

(c) "Oil or Grease"—a mixture of the first two, or fat of unknown composition.

There will also be made the following distinction between the different saponification data:

(a) "Saponification Figure (F)" will refer to the mgms. KOH required to saponify the total oil, or any of its components, in one gram of the original sample.

(b) "Saponification Value (V)" will indicate the mgms. KOH required to saponify one gram of the water-free total oil, or any of its components.

(c) "Saponification Number (N)" will refer to the mgms. KOH required to saponify any component contained in one gram of total fatty matter.

Thus the neutral fat in a sample composed of 50 per cent total fatty matter containing 20 per cent (based on the sample) neutral fat, one gram of the latter requiring 190 mgms. KOH for its saponification, will show a saponification figure of 38, saponification value of 190 and a saponification number of 76, all expressed as mgms. KOH.

The following procedure for the determination of neutral fat by the saponification method is suggested:

1. *Free and combined fatty acids (B)*[4]—Weigh 8 grams of the sample into a 500 cc. beaker, add 50 cc. of 95 per cent alcohol and several drops of phenolphthalein indicator. Run in N/2 NaOH until end point is reached; boil gently until no more NH_3 is given off (to be tested for, with moist red litmus paper), cool, add N/2 NaOH again until the pink color persists; again boil to drive off any remaining NH_3 and add N/2 NaOH after cooling to bring to end point. Record the total number of cc. of N/2 NaOH required. Add 150 cc. water and 5 cc. methyl orange indicator and titrate to acid end point with N/2 H_2SO_4. The number of cc. of N/2 H_2SO_4 required for this titration, corresponds to the combined and free fatty acids. Calculate to mgms. KOH per gram of sample = B.

2. *Alkali minus ammonia or fixed alkali (C)*[4]—In the test for combined and free fatty acids, the number of cc. N/2 H_2SO_4 minus total number of cc. of N/2 NaOH used to make alkaline corresponds to the alkali minus NH_3 (in the case of the presence of ammonium salts this may be a minus quantity). Preserve the sign and calculate to mgms. of KOH per gram of sample = C.

*Reprinted by permission from the Journal of the American Leather Chemists' Association.

[1] Jour. A. L. C. A. 24, 120 (1929).

[2] Chem Umschau 36, 97 (1929).

[3] Fäber-Ztg. 25, 169 and 194 (1914).

[4] Jour. A. L. C. A. 22, 588 (1927).

3. *Saponification figure of total fatty matter* ($F°$)[5]—2 to 2.5 grams of oil are boiled in an Erlenmeyer flask (Jena glass) of 200 cc. capacity for 30 minutes under a reflux condenser with 25 cc. of N/2 alcoholic potash measured from a pipette; a blank test with 25 cc. of this solution is run simultaneously, every operation being exactly the same as with the sample. The blank test is necessary in view of changes of temperature and the solubility of the glass in alkali. After saponification, 50 cc. of neutralized alcohol are added to the sample, boiled gently until no more NH_3 is given off (to be tested for with moist red litmus paper), and then titrated back with N/2 hydrochloric acid in the presence of phenolphthalein; the amount of acid necessary to neutralize the 25 cc. is also determined. Calculate the amount of alkali absorbed by the fat to mgms. KOH per gram = F°.

4. *Total fatty matter*—Usual procedure.

It will be noticed that the saponification figure of total fatty matter is the only new determination; the others are taken from the present A.L.C.A. methods. From the above data, the following formulas were derived:

Formula 1. Saponification figure of total fatty matter plus fixed alkali of sample, mgm. KOH per gram = $F° + C$.

Formula 2. Saponification value of total fatty matter, mgm. KOH per gram;

$$V° = \frac{100\ (F° + C)}{\text{Per cent total fatty matter}}$$

Formula 3. Saponification figure of neutral fat, mgm. KOH per gram; $Fn = (F° + C - B)$.

Formula 4. Neutral fat, approximate per cent of sample;

$$p = \frac{100\ Fn}{V°}$$

Formula 5. Approximate saponification value of neutral fat, mgms. KOH per gram;

$$Vn = (V° - 10 + \frac{p}{10}$$

Formula 6. Neutral fat, corrected, per cent of sample;

$$P = \frac{100\ Fn}{Vn}$$

Formula 7. Neutral fat, corrected, per cent of total fatty matter

$$= \frac{100\ P}{\text{Per cent total fatty matter}}$$

Formula 8. Saponification number of neutral fat, mgm. KOH per gram

$$= \frac{100\ Fn}{\text{Per cent total fatty matter}}$$

In formula 4, the saponification value ($V°$) of total fatty matter or mixed fat has been used instead of the saponication value of the neutral fat, which is not known. Hence the per cent neutral fat (p) so calculated is only approximate and is always lower than the correct value, from which it may differ by as much as 5 per cent. In formula 5, an attempt has been made to calculate the saponification value of the neutral fat (Vn) in the mixture; this can be determined approximately only, as follows: It can be shown that the difference in the saponification values between neutral fat and the corresponding fatty acids is approximately 10 mgms. With this assumption—and with the approximate per cent neutral fat (p) and the saponification value of total fatty matter ($V°$) given—the derivation of the following equation will be evident:

$$\frac{p}{100}\ Vn + (1 - \frac{p}{100})\ (Vn + 10) = 100\ V°$$

which reduces to the following simple formula:

$$Vn = V° - 10 + \frac{p}{10}$$

If we assume no lactones, anhydrides or other neutrals fats that do not contain glycerine, formulae 6 and 7 are probably correct to within the experimental error. Tables I and II below show the accuracy with which the saponification value of neutral fat, as well as the present neutral fat, may be calculated by means of the above formulas. Tables I represents known mixtures of neutral fat and fatty acids, having saponification values of 190 and 200 respectively; Table II (corresponding to a castor oil product) represents similar mixtures with saponification values of 170 and 188 respectively.

G. W. Priest, chairman of the A.L.C.A. Committee on sulfonated oils for 1929 and who instigated this paper, has kindly furnished the writer with the preliminary results of the work by his laboratory on the determination of neutral fat by various methods. In Table III is listed part of this data, from which were calculated, by means of Formulas 1 to 8 inclusive, the results given in Table IV. In Table V the neutral fat by extraction methods and the new method are compared.

It is evident from Table V that the results obtained by the saponification method are about twice as great as that by extraction with ether, and even greater when the extraction is made with petroleum ether. It seems therefore that extraction of the original undecomposed oil by solvents does not yield all of the neutral fat, or all the fat that will react with alkali. It would also seem to be established that some of the neutral fat must be sulfonated and, hence, partly soluble in water; consequently is only incompletely if at all extracted by solvents.

[5] Holde-Mueller, *First Eng. Ed.*, *p.* 342, 1915.

TABLE I.—SHOWING ACCURACY OF CALCULATING Vn

Saponification value neutral fat = 190
Saponification value fatty acids = 200

Mixture No.	1	2	3	4	5
Neutral fat, actual per cent	00	20	50	70	100
Fatty acids, actual per cent	100	80	50	30	00
Theoretical saponification value of mixture (V°), mgm. KOH	200	198	195	193	190
Theoretical saponification no. of neutral fat, mgm. KOH	00	38	95	133	190
Neutral fat (p) calculated, approximate per cent (Formula 4)	00	19.2	48.7	68.9	100
Difference between actual and approximate per cent neutral fat	00	—0.8	—1.3	—1.1	00
Calculated saponification value neutral fat (Vn), mgm. KOH (Formula 5)	190	189.9	189.9	189.9	190
Neutral fat, corrected, per cent (Formula 6)	00	20	50	70	100
Difference between actual and corrected per cent neutral fat	00	00	00	00	00

TABLE II.—SHOWING ACCURACY OF CALCULATING Vn

Saponification value neutral fat = 180
Saponification value fatty acids = 188

Mixture No.	1	2	3	4	5
Neutral fat, actual per cent	00	20	50	70	100
Fatty acids, actual per cent	100	80	50	30	00
Theoretical saponification value of mixture (V°), mgm. KOH	00	36	90	126	180
Theoretical saponification no. of neutral fat, mgm. KOH	00	36	90	126	189
Neutral fat (p) calculated, approximate per cent (Formula 4)	00	19.3	48.9	69.1	100
Difference between actual and approximate per cent neutral fat	00	—0.7	—1.1	—0.9	00
Calculated saponification value neutral fat (Vn), mgm. KOH (Formula 5)	178	178.3	178.9	179.3	180
Nertral fat, corrected, per cent (Formula 6)	00	20.2	50.3	70.3	100
Difference between actual and corrected per cent neutral fat	00	0.2	0.3	0.3	00

TABLE III.—ANALYSES OF SULPHONATED OILS

Sample No.	215	216	243	244
Free and combined fatty acids (B), mgm. KOH	72.36	77.10	77.61	54.31
Fixed alkali (C), mgm. KOH	—4.32	—21.17	38.40	17.50
Saponification figure of total fatty matter (F°), mgm. KOH	128.1	143.2	76.14	98.58
Total fatty matter, per cent	63.01	67.02	63.46	58.12
Neutral fat (petroleum ether extraction), per cent of sample	——	——	5.02	8.78
Neutral fat (ether extraction), per cent of sample	13.05	16.64	9.14	15.06

TABLE IV.—NEUTRAL FAT BY CALCULATION

Sample No.	215	216	243	244
Saponification figure total fatty matter plus fixed alkali, mgm. KOH	123.8	122.1	114.5	116.1
Saponification value total fatty matter (V°), mgm. KOH	196.5	182.2	180.4	199.8
Saponification figure neutral fat (F), mgm. KOH	51.42	44.93	36.93	61.74
Neutral fat, (p) approximate per cent of sample	26.18	24.66	20.47	33.90
Approximate saponification value neutral fat (Vn), mgm. KOH	189.1	174.7	172.5	192.9
Neutral fat, corrected, per cent of sample	27.2	25.8	21.4	32.0
Neutral fat, corrected, per cent of total fatty matter	43.2	38.5	33.7	55.1
Saponification number of neutral fat, mgm. KOH	81.7	67.0	58.2	106

TABLE V.—NEUTRAL FAT METHODS COMPARED

Sample No.	215	216	243	244
Method:				
Petroleum ether, extraction per cent sample	——	——	5.02	8.78
Ether extraction, per cent sample	12.05	16.64	9.14	15.06
Saponification or new method	27.2	25.8	21.4	32.0

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Chemists' Committees

(*From Page 297*)

Wheeling, W. Virginia; G. S. Jamieson, Bureau of Chemistry, Fat, Oil & Wax Laboratory, U. S. Dept. of Agriculture, Washington, D. C.

Refining Committee

C. B. Cluff, The Procter & Gamble Co., Ivorydale, Ohio, (Chairman); R. H. Fash, The Wort Worth Laboratories, Fort Worth, Texas; E. R. Barrow, Barrow-Agee Laboratories, Memphis, Tenn.; R. C. Hatter, 1303 Shelby St., Louisville, Ky.; J. J. Ganucheau, The Southern Cotton Oil Co., Gretna, La.

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Lint on Seed Committee

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The largest producers of vegetable oils in Java are the N. V. Oliefabriken Olvado, who have four factories for the production of coconut oil, castor oil, kapok oil and the cakes and meal by-products of these oils. In 1928 this organization crushed a total of 76.660 metric tons of copra and seeds and exported 34,156 metric tons of oil. The company's plants are located at strategic points on the island of Java and the Head Office is at Soerabaya.

Notes of the Industry

Oil Tariff Investigations

A series of production cost investigations of vegetable oils has been ordered made by the United States Tariff Commission under resolutions adopted by the senate. A resolution sponsored by Senator Morris Sheppard of Texas directs the commission to submit to Congress a detailed study of the costs of production and transportation to principal consuming markets in the United States of coconut oil and copra from the Philippine Islands and from other principal producing regions and also palm, palm-kernel, whale, rapeseed, perilla, and sesame oils.

The resolution also calls for a statement of the principal uses of these oils in the United States and of the kinds and amounts of domestic oils and fats replaced in domestic industry by these imports. As these oils are not produced in the United States the commission could not make such an investigation under the flexible provision of the tariff act, and this investigation will be conducted under its general investigating powers. The report will not be the basis for duty changes except by Congress.

A resolution offered by Senator Royal S. Copeland of New York directs the commission to make an investigation of the cost of production of olive oil, acting under the flexible provision of the tariff law. As the production costs of California olive oil are believed to be much higher than foreign costs, this investigation probably will lead to an increase in duty by Presidential proclamation if cost of production is the only factor considered.

The Tariff Commision made an investigation of a number of vegetable oils about four years ago, but this included many domestic oils, and coconut oil was the only one which is also included in the new investigations.

Procter in Baltimore

The new $5,000,000 plant of Procter & Gamble Co. at Baltimore is being put in operation the beginning of August, according to advices from Cincinnati. The new plant embodies all the latest developments in machinery and equipment. It is located on deepwater in Baltimore harbor and has facilities for docking ocean steamers. The plant will serve Export, Eastern and Southeastern markets for Procter & Gamble.

Haines Cottonseed Secretary

Pursuant to the amendment to the by-laws adopted at the 1930 meeting, the directors and executive committee of the National Cottonseed Products' Association have elected Earl S. Haines executive secretary of the association. Mr. Haines will have his office in Memphis.

George H. Bennett, Dallas, formerly secretary-treasurer of the association, has been elected treasurer, Christie Benet, general counsel, and A. L. Ward, educational director, have been re-elected by the directors and executive committee.

The Interstate Cotton Oil Company has been incorporated under the laws of the State of California with $500,000 capital.

Wesson Oil & Snowdrift Company and subsidiaries reported for nine months ending May 31, net profits of $2,237,531, after depreciation and Federal taxes, being equal to $1.73 a share on outstanding common stock, after preferred dividend requirements. Consolidated balance sheet of the company showed total assets of $42,935,497.

Kellogg Salesmen Meet

District Managers of the Spencer Kellogg & Sons Sales Corporation were guests of the management at a three days sales conference in Buffalo recently. Sessions were held in the Hotel Statler, where company officials discussed the business outlook, merchandising plans of the firm, and other topics of interest. A golf tournament, a dinner, and other social events were on the program.

Rosalind U. Norris

Miss Rosalind U. Norris, formerly Chief Chemist of Richard Hellman, Inc., and the only woman to hold Active Membership in The American Oil Chemists' Society, died on July 9, at Levesinet, France, after a brief illness.

Miss Norris was a daughter of the late Dr. Henry Lee Norris. She was graduated from Teachers' College, Columbia University, in 1917 and later did Graduate work in Chemistry. Until her death, Miss Norris had been traveling for several months in Europe with a sister.

American Maize Income

The American Maize Products Company has reported for 1929 a net income of $1,548,440, or $4.81 a common share after preferred dividend requirements. This compares with $589,205, or $1.61 a share, in 1928.

Current assets at the end of 1929 were $3,700,852, and current liabilities, $355,112, leaving a net working capital of $3,345,740, compared with $4,182,038 in June, 1929. During 1929 the company acquired 9,432 shares of preferred stock, which is held in the treasury. The common stock was changed from $100 par to no-par and 300,000 new shares were issued for 30,000 old $100 par stock.

Total assets at the end of 1929 were $7,482,687.

Penick & Ford, Ltd., will add two buildings to its plant at Cedar Rapids, Iowa, this summer. One building will be a 50-by-70-foot two-story addition to the dry starch plant, and the other, a three-story structure for office, assembly and recreational uses. Equipment in the starch plant addition will represent further investment of $70,000, and that for the office building about $60,000.

Swift & Co., have contracted for the erection of a lard refinery at Nuevo Laredo, Mexico, to which crude lard will be shipped from the United States in bulk. The new plant will facilitate distribution to meet the steadily growing demand in Mexico for lard.

New Books

Publication 276, of the Botanical Series of the Field Museum of Natural History, Chicago, is entitled "A Study of Some Characteristics of Vegetable Oils," by James B. McNair, Assistant Curator of Economic Botany. The publication discusses the possibility of relationship between characteristics of oils and fats, with particular reference to their melting points and the climatic habitat of the parent plants. Comprehensive tables, grouping the oils and fats according to progressive values of the more important characteristics, are included, the various plants being referred to according to accepted botanical names only.

The Soybean Oil of China and Its Manifold Uses, by A. A. Horvath, published by the Bureau of Industrial and Commercial Information, Ministry of Industry, Commerce and Labor, National Government of the Republic of China, Booklet Series No. 13.

This brochure gives a quick picture of the history of soybean oil production in China, the present methods of producing the oil, and the various uses to which the oil may be put, including edible, paint-making, soap-making, rubber substitute and other uses. An interesting chapter discusses the possibility of producing artificial petroleum products from soybean oil.

Neutral Fat Determination

(*From Page* 305)

It is also interesting to note that Herbig[6] extracted a sample of sulfonated castor oil (containing 59.9 per cent total fatty matter and 5.8 per cent organically combined SO_3) with cold acetone and found that the extract, supposedly the neutral fat, was 26.51 per cent of the oil—a result more closely in agreement with the writer's method than with the present extraction method.

Neutral fat may conveniently be expressed in any one of the following ways:

(a) Saponification figure, *i. e.*, mgm. KOH per gram of sample.

(b) Per cent of sample.

(c) Saponification number or "neutral fat-number" *i. e.*, mgm. KOH per gram of total fatty matter.

(d) Per cent of total fatty matter.

Results expressed by the last two methods are obviously more complete than by the others, since they already take into account the per cent total fatty matter in the sample; they offer also the advantage in that the composition of the fatty matter in different samples may be more directly compared. As the "neutral fat-number" (c) is more readily calculated than the per cent neutral fat and furnishes almost as much information, it would seem to offer the best means for reporting the latter.

A new method is suggested for estimating neutral fat in sulfonated oils by means of saponification tests. Detailed procedures are outlined and the necessary formulas developed.

Mention has already been made of the courtesy extended by Priest in supplying the data in Table III. The writer is also greatly indebted to Priest and to J. W. Harnly for many helpful suggestions and corrections.

[6] *Loc. cit.*

ABSTRACTS

David Wesson, *Abstract Editor*

A quantitative method for determining moisture and total fat by means of trichlorethylene distillation is described as follows: a 50-100 cc. extraction flask with a wide and long neck receives in the neck the paper extraction thimble with the sample. The trichlorethylene vapors from the extraction flask enter a condenser from above through a side-necked adapter and leave the condenser at the bottom to enter a U-tube which has its long arm graduated while the shorter arm is bent to return to the extraction flask, thus acting as an overflow and returning the solvent to the flask. The moisture collects in the graduated arm above the heavier trichlorethylene and is measured; this moisture collecting arm should be calibrated by blank runs against known weights of added water. Another condenser with a calcium chloride tube is mounted above the adapter to keep out moisture; the cooling water must be kept above 10°C. to avoid the formation of emulsions. *Chem.-Ztg.* 54,271-2(1930).

In a study of the physical chemistry of fatty acids, copper and aluminum were exposed to the conditions of an autoclave used in fat hydrolysis, operating at a pressure of 12 atmospheres for 1024 hours. The measured corrosion of copper by technical peanut oil at 188° was 0.009 gram per square meter per hour, of aluminum, 0.042 gm./sq.m./hr. Stearic acid corroded nickel to the extent of 0.62 gm./sq.m./hr. at 190°. The discoloration of technical fatty acids is not due to the influence of light. *Z. angew. Chem.* 42,1033-5(1929).

A dark brownish green fatty oil has been obtained from coriander seed oil after the distillation of the essential oil. This fixed oil showed a saponification number of 192, iodine number 93.81, refractive index 1.4688 at 26°. After two months the oil showed only a slight change in acidity and oxygen absorption. *Maslob. Zhirov. Delo.* 1929, No. 8, 25-6.

"Distillate olein" in a tinned can turned a dark brown color on exposure to air, because of dissolved iron; unexposed oleic acid of the same grade from freshly opened cans retained its original color. *Seifensieder-Ztg.* 57,205 (1930).

In a recently patented process for rendering fatty and oily materials with steam, the material is heated sufficiently high while restricting the escape of steam to develop disintegrating steam pressure in the material from the moisture present; the mass is agitated to assist the disintegration; simultaneously portions of the moisture are removed in the form of steam and the fats and oils present are melted, while maintaining the disintegrating pressure, until the moisture content of the solid residue has been reduced to between 17 and 35%. U. S. Pat. No. 1,761,480.

Triethanolamine has been shown to be well suited for emulsification purposes and to have a number of advantages over the usual inorganic bases used for this purpose. *Ind. Eng. Chem.* 22, 143-6 (1930).

The qualitative composition of silver black fox fat may be expressed in terms of the glycerides of palmitic, stearic, oleic and linolic acids. In its physical and chemical constants this fat bears some semblance to that of the wild fox. *Trans. Wis. Acad. Sci. Arts & Letters* 25, 113-6 (1930).

For the determination of the acid number of raw oils, linseed oil varnish or bodied linseed oil, 5 to 10 grams of the oil are dissolved in 50 cc. of a mixture of alcohol and ether or benzene. In the case of a resin, about 3 grams of the resin are dissolved in 75 cc. of a mixture of 2 parts of benzene and 1 part of alcohol. If the resin is not completely soluble, as in the case of certain copals, it is heated and filtered. Then 50 cc. of hot salt solution and 15-20 grams of pulverized salt are added to the filtrate, after which 20 drops of phenolphthalein solution are added and the solution titrated to a dark carmine color with tenth-normal sodium hydrate solution. It is then quickly back-titrated with tenth-normal sulfuric acid to a pale rose color. If there has been an insoluble portion it must be determined and taken into consideration in the calculation of the acid number. *Bull. des Mat. Gras.* 8566 (1929).

Cottonseed Analysis

(*From Page 292*)

tube and place a layer of absorbent cotton on the plate. Place the meats in the prepared tube and pour sufficient portions of petrolic ether on the meats to extract at least 5 grams of oil. Receive the extract in a tared flask. Evaporate the ether from the oil on a steam bath. Care must be taken to see that all the ether is removed from the oil. Weigh the oil, add 30 cc. neutralized alcohol (Formula 30) and titrate the free fatty acid of the oil with standard alkali, using phenolphthalein as the indicator. (0.1 N alkali is used if f. f. a. if low, but 0.25 N is used for oils with f. f. a. above 3 per cent). The addition of a small amount of petrolic ether before titration makes the end point sharper. The titration is performed in a flask which is shaken vigorously during the titration, the end point being taken when a permanent pink is obtained which persists for at least one minute.

$$\text{Per cent F. F. A.} = \frac{28.2 \times \text{Normality of alkali} \times \text{cc. used}}{\text{weight of oil}}$$

California Olive Oil

(*From Page 296*)

that California oils be further studied along these lines, with the idea of calling attention to cases of considerable variation from the average; second, that the average figures of 80 yellow—5 red—2 blue for color, 15-16 for relative viscosity, and 1.0 per cent. for free fatty acid be considered as tentative standards for the purpose of such investigation; and third, that a slight but distinct positive Kreis test be considered tentatively as maximum permissible rancidity for the purpose of such investigation.

References

[1] Kerr, R. H. Jour. Ind. Eng. Chem., *10*: 471-475 (1918).

[2] Issoglio, G. Ann. Chim. Applicata, *6*: 1-18 (1916); Atti. Accad. Sci. Torino, *51*: 582-605; Chem. Abs. *10*: 2943 (1916). (Original not seen.)

[3] Fellenberg, T. von Mitt. Lebensm, Hgy. *15*: 198-208 (1924); Chem. Abs. *18*: 3731 (1924). (Original not seen.)

[4] Vintilesco, I., and Popescu, A. Bul. Acad. Sci. Roumaine, *4*: 151-157 (1915); J. Pharm. Chim. *12*: 318-323 (1915); Chem. Abs. *10*: 646 (1916). (Original not seen.)

Soap Chemists' Report

(*From Page 301*)

The committee and cooperating laboratories follow:

Ralph W. Bailey, Stillwell & Gladding, Inc., New York City; Chas. J. Gundel, Works Chemist, Fels & Co., Philadelphia; L. F. Hoyt, Manager, Research Dept., Larkin Co., Inc., Buffalo; Martin H. Ittner, Chief Chemist, Colgate-Palmolive-Peet Co., Jersey City; H. J. Morrison, The Procter & Gamble Co., Ivorydale; W. D. Richardson, Chief Chemist, Swift & Co., Chicago; M. L. Sheely, Chief Chemist, Armour Soap Works, Chicago; M. L. Sheely, Chief Chemist, Armour Soap Works, *Babbitt Lab.*, Jersey City; H. P. Trevithick, Chief Chemist, New York Produce Exchange, New York City; R. B. Trusler, Industrial Fellow, Mellon Institute, Pittsburgh; H. C. Bennett, Chief Chemist, Los Angeles Soap Co., Los Angeles; V. K. Cassady, Chief Chemist, The Palmolive Co., Milwaukee; Curtis & Tompkins, San Francisco; M. R. Dickson, Chief Chemist, Colgate - Palmolive - Peet Co., Berkeley; M. M. Durkee, The A. E. Staley Mfg. Co., Decatur; F. E. Joyce, Haskins Bros. & Co., Omaha; A. J. Harvey, Technical Director, Lever Bros., Ltd., Toronto; John Ornfelt, LaFrance Mfg. Co., Philadelphia; Foster D. Snell, Brooklyn; W. J. Reese, Chief Chemist, Colgate - Palmolive - Peet Co., Kansas City; Wm. A. Peterson, Chief Chemist, Kirkman & Son, Brooklyn, Secretary, Soap Section, A. O. C. S.; A. K. Church, Chief Chemist, Lever Brothers Co., Cambridge, Chairman, Soap Section, A. O. C. S.

The Institute for Commercial Expansion of the Ministry of Agriculture, Industry and Commerce of Brazil has issued a very complete discussion entitled "The Babassu Nut," published in Portuguese and English, which gives extensive information on the occurrence in Brazil of the Babassu palm, the products which may be developed from the palm and the conditions surrounding its exploitation. The booklet is well prepared and attractively printed. It is profusely illustrated with half-tones and contains maps of the babassu-producing areas, together with many beautifully designed colored charts setting forth exports of babassu products in recent years and imports of various commodities which may be affected by the development of the babassu industry.

Referee Applicant

Mr. Clinton Morris, of Morris-Flinn Company, Macon, Georgia, has applied to the American Oil Chemists' Society for Referee Chemist certification on all products covered by the Rules of National Cottonseed Products Association. (*First Publication*)

Prices

Candles, adamantine 6s 16 oz.			
20-set cases	**set.**	**.14½**	**.15¾**
40-set cases	**set.**	**.14**	**.14½**
Candles, paraffin, cs., 14 oz., case of 40 sets	**set.**	**.10**	**.10¼**
6s 14 oz., case of six cartons containing 36 sets	**set.**	**.11**	**.11¼**
6s 12 oz., 40 set cases	**set.**	**.09**	**.09¼**
6s 12 oz. cases of six cartons containing 36 sets	**set.**	**.10**	**.10¼**
Patent ends	**set.**	**.17¾**	**.18**
Stearin 6s 16 oz., plain, cases	**set.**	**.16¾**	**.17**
Castor, No. 1, bbls.	lb.	.12¼	.12½
No. 3, bbls.	lb.	.11¾	.12
Chinawood, bbls. or drs.	lb.	.09	.09¼
Coast, tanks, spot	lb.	.07¾	.07⅞
Futures	lb.	.07¾	—
Coconut, Ceylon grade, bbls.	lb.	.07⅜	.07½
Coast, Tanks, Domestic White	lb.	.06	—
Cochin grade, bbls.	lb.	.07¾	.07⅞
Manila, bbls.	lb.	.07⅜	.07½
Tanks, N. Y.	lb.	.06⅜	—
Fatty acids, mill tanks	lb.	.08¼	nom.
Cod, Newfoundland, bbls.	gal.	.54	.55
Copra, bags, coast	lb.	.03⅝	.03¾
Corn, tanks, mills	lb.	.07	—
Bbls., New York	lb.	.09	nom.
Refined, bbls.	lb.	.10	nom.
Fatty acids	lb.	.07	nom.
Cottonseed, crude, eanks, mills	lb.	—	nom.
P. S. Y.	lb.	.07⅞	.08
Fatty acids, mill, bbls.	lb.	.07½	nom.
Degras, domestic, bbls.	lb.	.03¾	.04½
English, bbls.	**lb.**	**.04½**	**.05**
German, bbls.	lb.	.03¼	.03¾
Neutral, domestic, bbls.	lb.	.07¾	.08½
English, bbls.	**lb.**	**.08**	**.09**
German, bbls.	**lb.**	**.07**	**.07½**
Greases, choice white, bbl., N. Y.	lb.	.05	.06¼
Yellow	lb.	.04¾	.04⅞
Brown	lb.	.04⅝	.04¾
House	lb.	.04¾	.04⅞
Herring, coast tanks	gal.	—	nom.
Horse, bbls.	lb.	.08¼	nom.
Lard, city tierces	lb.	.09¾	—
Compound, tierces	lb.	.10½	.10¾
Middle Western, tierces	lb.	.10	—
Neutral, tierces	lb.	.11	nom.
Prime Western, tierces	lb.	.10⅛	—
Lard oil, No. 1, bbls.	lb.	.09½	—
No. 2, bbls.	lb.	.09¼	—
Extra bbls.	lb.	.10	—
No. 1, bbls	lb.	.09¾	—
Winter strained, bbls.	lb.	.10½	—
Prime, bbls.	lb.	.12½	—
Linseed Oil, boiled, tanks	lb.	.1360	—
Car lots, bbls.	lb.	.1440	—
Less car lots, bbls.	lb.	.1480	—
Less than 5 bbls.	lb.	.1520	—
Double boiled, less than 5 bbls.	lb.	.1550	.1580
Raw, tanks	lb.	.1320	—
Car lots, bbls.	lb.	.1400	—
Less car lots, bbls.	lb.	.1440	—
Less than 5 bbls.	lb.	.1480	—
Refined, bbls.	lb.	.1470	.1510
Varnish grades, bbls.	lb.	.1490	.1530
Linseed cake, bags	ton	30.00	—
Meal, bags	ton	40.00	41.00
Menhaden, crude, tanks, Baltimore	gal.	.27	—
Light pressed, bbls.	gal.	.53	.55
Yellow bleached, bbls.	gal.	.55	.57
White bleached, bbls.	gal.	.58	.60
Mustard, bbls.	gal.	.90	—
Neatsfoot, cold pressed, bbls.	lb.	.16¾	—
Extra, bbls.	lb.	.10	—
No. 1, bbls.	lb.	.09¾	—
Pure, bbls.	lb.	.12	—
Oleo, No. 1, bbls.	lb.	.10⅛	—
No. 2, bbls.	lb.	.09⅝	—
Olive, denatured, bbls., N. Y.	gal.	.68	.70
Shipments	gal.	.68	—
Foots, bbls.	lb.	.06	.06¼
Shipments	lb.	.06	—
Edible, bbls.	lb.	1.75	2.00
Palm, Lagos, casks, spot	lb.	—	.05⅛
Shipments	lb.	—	.05⅛
Niger, casks, spot	lb.	—	.05½
Shipments	lb.	—	.05⅛
Palm Kernel, pkgs.	lb.	.06¼	.06½
Tank cars	lb.	.06	—
Peanut, crude, bbls.	lb.	.09¼	.09⅜
Mills, tanks	lb.	.07¼	nom.
Refined, bbls.	lb.	.11¾	nom.
Perilla, bbl.	lb.	.12	.12¼
Poppy Seed, bbls.	gal.	1.70	—
Rapeseed, blown, bbls.	gal.	.76	.78
Refined, bbls.	lb.	.62	.63
Red Oil, distilled bbls.	lb.	.09⅛	.09⅜
Tanks	lb.	.08¼	—
Saponified, bbls.	lb.	.09⅛	.09⅜
Tanks	lb.	.08¼	—
Salmon, coast, tanks	gal.	.35	nom.
Sardine, coast, tanks	gal.	.35	nom.
Sesame, refined, drums	lb.	.12	.12½
Soya Bean, blown, bbls.	lb.	.11¾	.12
Crude, bbls.	lb.	.10¾	.11
Orient, coast, tanks	lb.	.08½	.08⅝
Sperm, bleached f.o.b., New Bedford bbls.	gal.	.84	.85
Natural, f.o.b., New Bedford, bbls.	**gal.**	**.78**	**.80**
Stearic Acid, Double pressed, bags	lb.	.13½	.14
Triple pressed, bags	lb.	.15½	.16
*Stearine oleo, bbls.	lb.	.08⅛	.08¼
Tallow, edible, bbls.	lb.	.06¼	.06⅜
City, extra, works, loose	lb.	.05⅛	—
Special, works, loose	lb.	.05¼	—
Tallow, oil, acidless, bbls.	lb.	.09⅛	—
Tanks, N. Y.	lb.	.09	—
Vegetable tallow, coast, mats	lb.	.06¼	nom.
Whale, crude, No. 1, coast, tanks	**lb.**	**.07**	—
No. 2, coast, tanks	**lb.**	**.06½**	—
Refined, winter bleached, bbls.	**gal.**	**.80**	—
Extra, bbls.	**gal.**	**.82**	—
Natural, bbls	gal.	.78	—

.1320	—
.1400	—
.1440	—
.1480	—
.1470	.1510
.1490	.1530
30.00	—
40.00	41.00
.27	—
.53	.55
.55	.57
.58	.60
.90	—
.16¾	—
.10	—
.09¾	—
.12	—
.10⅛	—
.09⅝	—
.68	.70
.68	—
.06	.06¼
.06	—
1.75	2.00
—	.05⅛
—	.05⅛
—	.05⅛
—	.05⅛
.06¼	.06½
.06	—
.09¼	.09⅜
.07¼	nom.
.11¾	nom.
.12	.12¼
.70	—
.76	.78
.62	.62
.09⅛	.09⅜
.08¼	—
.09⅛	.09⅜
.08¼	—
.35	nom.
.35	nom.
.12	.12½
.11¾	.12
.10¾	.11
.08½	.08⅝
.84	.85
.78	.80
.13½	.14
.15½	.16
.08⅛	.08¼
.06¼	.06⅜
.05⅛	—
.05¼	—
.09¼	—
.09	—
.06¼	nom.
.7	—
.6½	—
.0	—
.2	—
.8	—

Market Report on

FATS, OILS AND GREASES

(*As of July 25, 1930*)

NEW YORK—The market for oils, fats and greases during the recent period was featured by numerous price advances. Changes in quotations were fewer in number than in any month for the past year, and more than half of these represented revisions to higher levels. This show of strength in the oil and fat market is the second during the past year, the first sign of a brace in the market coming three months ago, but being followed by renewal of the falling curve in the two succeeding periods. The shift back to rising prices again this period carries out the prediction of a leading authority in the market who stated that the market would be featured by a number of successive small advances and recessions before any definite upward trend would develop. No long term upward movement may be expected, according to this man, until the present situation of excess production and heavy stocks is changed.

Tallow registered an abrupt advance in contrast with its decline of last period. Buyers' inquiries increased as a result of attractive prices quoted recently, making producers less anxious to quote these comparatively low figures. Grease also moved upward along with tallow, showing the same increase of interest among buyers and decrease of offerings on the part of sellers. A slight advance was also noted in lard in spite of generally quiet conditions in this market. Palm oil was advanced by dealers who reported light stocks and smaller offerings on the part of shippers. The cottonseed oil market was quiet throughout the period, with the official government report showing smaller stocks than were held last month and last year at this time. Red oil and stearic acid were two of the products on the declining side of the market, duplicating their drop of last period. Chinawood oil and rapeseed oil were also fractionally lower. The principal decline was registered by menhaden oil which opened the season under last year's figure and subsequently declined again.

Chinawood Oil

Another fractional decline was noted in chinawood oil in a quiet market. Inquiries and offerings were light and sales were only for small amounts. Chinese exchange was comparatively quiet.

Coconut Oil

The market for coconut oil was considerably firmer during the recent period, quotations advancing to 6c lb. in some quarters for prompt shipment. A livelier inquiry was noted.

Corn Oil

This oil was firm although unchanged in price. Stocks were reported to be light, buyers were more active and many sellers were inclined to take an optimistic view of the situation in view of strength in competing product.

Cottonseed Oil

The cottonseed oil market was quiet during the recent period with prices slightly lower at the close. Southern markets were also quiet with light offerings. The official government report in July showed an acreage this year of 45,815,000 acres. Stocks on the first of July totaled 1,090,703 barrels of crude and refined oil as against 1,193,465 barrels at the same time last year.

Grease

In conjunction with the advance in tallow came a rise in quotations on grease. House grease advanced to 4¾c lb., inside, from 4⅝c lb. last period.

Lard

An advance of ⅛ to ¼c lb. was noted on all except one grade of lard in spite of the fact that purchases remained small. The movement of hogs to Western markets was no better than moderate at any time during the period.

Palm Oil

Palm oil was advanced fractionally by dealers who reported lighter offerings from primary markets.

Red Oil and Stearic Acid

Another decline of ½c lb. was noted in these products due to lower cost of raw material.

Tallow

City extra tallow was quoted at 5⅜c lb. at the close, a considerable advance from the 5c price which prevailed last period. Special tallow was offered at 5¼c lb., an advance of ½c. These higher quotations followed an increase in buyer interest in the market.

OIL & FAT INDUSTRIES

The Editor's Page

The Year's Trend

WITH the publication of the Census Bureau's Statement covering factory operations and warehouse stocks of fats and oils for the second quarter, those engaged in the industries are given an opportunity for pause to consider the trend of production and consumption as compared with the same items during the corresponding period of the previous year.

An examination of the Statement, which is published elsewhere in this issue, shows an appreciable decrease in second quarter production of all classes of oils and fats with the exception of cottonseed, peanut and soy bean oils, and tallow. The total production of vegetable oils during the second quarter of the current year was over sixty-one million pounds less than in the corresponding quarter of 1929. In animal fats produced the decline was nearly twenty-three million pounds, in fish oils two million pounds and in greases eight million pounds, making a gross reduction in production of oils and fats of about ninety-four million pounds. Considering individual fats and oils, the production of lard declined thirty-two and one-half million pounds, that of linseed oil forty-nine million pounds, coconut oil fourteen and a half million pounds, corn oil one and a half million, and greases eight million pounds. Factory and warehouse stocks show decreases, as against the same time during the previous year, in some cases much greater than the corresponding decrease in production. Stocks of lard, for example were fifty-three and a half million pounds less at the end of the second quarter this year than at the end of the same quarter of 1929, in the face of considerably reduced demand from European buyers. Cottonseed oil, with increased production and slightly decreased factory consumption, still showed lighter stocks at the quarter by forty million pounds, indicating that it is being utilized by consumers as a substitute for some of the other fats with lighter production.

It would be superfluous for us to attempt to interpret the meaning of these figures to our readers. We will be content with stating the comparison and let others undertake propheries.

What Is the Cost?

ONE of our esteemed contemporaries in the meat packing field has reecived the following letter from a reader:

Editor The ——— :

Will you please give me information as to the cost per 100 *lbs. for refining prime crude cottonseed oil with caustic soda solution, bleaching and deodorizing the oil for cooking purposes?*

Our friend replied most wisely, in part as follows: "The cost of refining prime crude cottonseed oil is dependent very largely upon the amount of oil handled. The physical condition of the plant and the efficiency of operation are important factors also. The question of quality is an important one, because some operators are apparently satisfied with 'getting by' with antiquated equipment, such as atmospheric deodorizing tanks, while others use the latest type of high vacuum deodorizing equipment."

We commend this reply to all who operate manufacturing plants, be their respective factories cottonseed oil refineries, margarine plants, mayonnaise factories, soap works or steel mills. He who is satisfied with 'getting by' will not 'get by' for very long. In our progressive, inventive age every manufacturer who has even one competitor must be constantly on the alert to avoid becoming; first a marginal producer who, because of antiquated machinery and methods can prosper only in the piping times of unusual demand; then a has-been, who has seen all his business flee from him to competitors who have bested him in quality or price, or both. The first essential of avoiding such calamities, is, of course, to know your costs. Accounting practice has advanced sufficiently to enable any manufacturer to know definitely what his departmental unit costs amount to. Knowing his costs, and having obtained unbiased opinions from purchasers and others as to the quality of his products compared to that of competitors' offerings, any manufacturer can quickly determine whether his processes are more costly than they should be to enable him to compete profitably. The necessary steps for improvement are then easy of accomplishment.

Thus, by knowing costs, he will avoid the inevitable cost of 'just getting by.'

After three weeks of testimony at Montgomery, the Federal Trade Commission has discontinued its investigation into alleged price fixing in the cottonseed industry until September when hearings will be continued at Washington. More than a score of witnesses were heard during the hearing, including cotton ginners who charged that oil mills are in a combination to hold down the price of seed.

On the last day of the hearing Leo Espy, Gordon, Alabama, gin operator, testified he was forced last season to "speculate" to make a profit out of cottonseed. He said he was a party to the injunction obtained by a number of ginners stopping the oil mills of the state from operating under the so-called Memphis trade rule. He stated that all mills in the state paid the same price for seed last year except one in Troy, Alabama, which offered a dollar bonus on each ton.

The Brown Linseed Corporation, Richmond Borough, N. Y., has filed a certificate in the office of the secretary of State of New York, at Albany, changing its capital from 12,000 shares of no par value to 1,000 shares of preferred stock of $100 par value and 22,000 common shares of no par value.

Linseed oil freight rates from Chicago Heights, Ill., to Alabama, Tennessee, and Kentucky are attacked in a complaint filed with the Interstate Commerce Commission by the Bisbee Linseed Company, Chicago Heights, declaring that the rates are not properly adjusted to those from Milwaukee.

The Cook-Swan Oil Corporation, fish, vegetable and animal oils and greases, has removed from 66 Beaver Street, New York, to larger quarters at 401 Broadway, where the entire twenty-seventh floor has been leased. The new telephone number is Canal 2540.

Swift & Co., Chicago, are reported to be planning a building program which will involve the expenditure of approximately $2,000,000.

Cottonseed oil is said to be attacked by the active gas from a water vapor discharge tube. Fibrous substances are produced which are insoluble in ether and other organic solvents. Olive, linseed and castor oils are said to yield similar compounds. *J. Am. Chem. Soc.* 52,2454-5(1930).

Shortening and Oil Prices

Prices of shortening and salad and cooking oils on Thursday, Aug. 28, 1930, based on sales made by member companies of the Shortening and Oil Division of the National Cottonseed Products Association, were as follows:

Shortening

	Per lb.
North and Northeast:	
Carlots, 26,000 lbs.	@10½
3,500 lbs. and up	@10¾
Less than 3,500 lbs.	@11¼
Southeast:	
3,500 lbs.	@10¼
Less than 3,500 lbs.	@10¾
Southwest:	
Carlots, 26,000 lbs.	@10¼
10,000 lbs. and up	@10½
Less than 10,00 lbs.	@10¾
Pacific Coast:	@11½

Salad Oil

North and Northeast:	
Carlots, 26,000 lbs.	@10¾
5 bbls. and up	@10½
1 to 4 bbls.	@11¼
South:	
Carlots, 26,000 lbs.	@10
Less than carlots	@10¼
Pacific Coast:	@10¼

Cooking Oil—White

⅛c per lb. less than salad oil.

Cooking Oil—Yellow

¼cc per lb. less than salad oil.

Because the Lieberman - Storch - Morawski reaction for detecting the presence of rosin is subject to failures when small amounts of rosin are present, produces different colors when large amounts are present and is not specific for rosin, F. Michel has revised the method as follows: Rosin-containing material is dissolved in three cc. of chloroform, five cc. of sulfuric acid (65-67%) added and the mixture strongly shaken for a few seconds. Three milligrams or more of rosin will give the acid a strong yellow color. Fractions of a milligram of rosin will be detected when a further dropwise addition of acetic anhydride is very carefully made, the chloroform thereby assuming a violet color. Vigorous shaking gives the acid a purple-red to carmine-red color. The procedure is repeated until the chloroform is no longer colored by the acetic anhydride and the acid has assumed an unchangeable color. To detect rosin in admixture with mineral oils, fats, fatty acids, etc., it is best to use the residue from a 70% alcohol extraction of the material for the test. Soap and soap products are first acidified and the rosin extracted with dilute alcohol.—*Chem. Ztg.* 54, 182-3 (1930).

Solid Fatty Acids

*Their Determination by the Salt-Alcohol Method Using the Original Sample**

By WALTER F. BAUGHMAN and GEORGE S. JAMIESON

THE lead salt-alcohol method for the separation and determination of solid fatty acids, as described by Twitchell (*J. Ind. Eng. Chem. 13,* 806, 1921) is based upon the use of a weighed quantity of the total fatty acids instead of the original sample of fat or oil. It is often desirable to use this method without first preparing the anhydrous total fatty acids. Besides, the separation of the total fatty acids requires considerable time. For these reasons, it was of interest to determine the conditions under which the lead salt-alcohol method may be applied successfully to the oil or fat sample.

The first set of experiments was made with refined cottonseed oil. Portions of about 6 grams (accurately weighed) were saponified in Erlenmeyer flasks with excess of alcoholic potash. After the addition of glacial acetic acid, equivalent to the alkali used, a hot alcoholic solution of 1.5 g. of lead acetate, as specified by Twitchell (loc. cit.) was added to precipitate the solid fatty acids. This quantity of lead acetate is in excess of that equivalent to the solid acids but is less than the amount equivalent to the total fatty acids.

The precipitate was separated by filtration, washed, redissolved in 100 cc. boiling alcohol containing 0.5 cc. acetic acid and allowed to reprecipitate by cooling according to the Twitchell directions. The fatty acids were separated from the lead salts and weighed, but the results were lower than those obtained by the original Twitchell method, in which the total fatty acids were used for the working sample or by the lead salt-ether method. When only sufficient acetic acid to neutralize the alkali in excess of the amount equivalent to the total fatty acids in the sample was used, and the lead salts of the solid acids were precipitated as described above, the results were higher but were still too low. Increasing the amount of lead acetate used for the first precipitation, also caused higher results. It was also evident that in order to precipitate completely the solid acids as lead salts from an alcoholic solution containing the potassium salts of the solid and liquid fatty acids and potassium acetate, it was necessary to use an amount of lead acetate in excess of the amount equivalent to the total fatty acids.

Finally, the following directions for determining the percentage of solid fatty acids in an oil or fat were found to give satisfactory results. Weigh into a 300 cc. Erlenmeyer flask a quantity of the oil or fat that is estimated to contain (if possible) 1 to 1.5 g. of solid acids, in no case using more than a 6 g. sample. Saponify alcoholic potash solution prepared as directed in the A.O.A.C. method for determining the saponification number (40 g. potassium hydroxide dissolved in 1 liter pure 95 per cent ethyl alcohol). (*Official and Tentative Methods of Analysis of the Association of Official Agricultural Chemists.* Revised July 1, 1924. Page 288). Forty cc. of this solution are sufficient to saponify a 6 g. sample. After saponification add a few drops of phenolphthalein indicator, neutralize the excess potassium hydroxide with glacial acetic acid from a burette and add one drop of acid in excess. Add sufficient 95 per cent alcohol to bring the volume to 150 cc. Dissolve 5 g. of lead acetate in 50 cc. of alcohol. Heat both solutions to boiling and pour the lead acetate solution into the soap solution. Allow this to cool slowly to room temperature, and leave it over night in an ice box at approximately 15° C. Filter through an 11 cm. filter paper and wash the precipitate and flask with cold 95 per cent alcohol until a sample of the washings, diluted with water, remains clear. Wash the precipitate completely from the filter through a wide stem funnel back into the flask with about 100 cc. of alcohol, add 0.5 cc. glacial acetic acid and heat to boiling. The precipitate will slowly dissolve. Cool the solution slowly to room temperature and again allow to remain over night in the ice box at 15° C. Filter and wash with alcohol as before. Transfer the precipitate from the filter and flask into a 500 cc. separatory funnel with ethyl ether, add about 25 cc. hydrochloric acid (1-1) to decompose the lead salts and shake. Also decompose the small amount of lead salts adhering

*(Contribution from Oil, Fat and Wax Laboratory, Bureau of Chemistry and Soils, U. S. Department of Agriculture).

to the sides of the flask with a little hydrochloric acid and wash into the separatory funnel with ether. Wash the ethereal solution of solid acids with water until the washings remain clear when tested with an aqueous silver nitrate solution. Dehydrate the ethereal solution with 6 or 7 g. anyhydrous sodium sulphate. Pour the solution through a 7 cm. filter into a weighed 200 cc. Erlenmeyer flask. Wash the separatory funnel and filter with several portions of ether. Distill off the ether, heat the flask in an oven at approximately 110° C. (in an atmosphere of CO_2 if iso-oleic acid is present) until the weight is constant, and obtain the weight of the solid fatty acids. Determine the iodine number of the solid fatty acids.

The figures in the first column of the accompanying table were obtained by following the foregoing directions. (The percentages in Column 3 were calculated from figures obtained by the original Twitchell method, with total fatty acid samples, and the calculations were made with the assumption that the oils or fats contained 95.5 per cent total fatty acids. The percentages of solid acids in Column 5 were determined by the lead salt-ether method and corrections were made for the small amount of unsaturated liquid acids that contaminates the solid acid fraction when this method is used (*J. Amer. Chem. Soc. 42,* 2398 (1920); *Cotton Oil Press,* Vol. 6, No. 1, p. 41 (1922). For samples 5 to 10 inclusive, the unsaturated acids are measured by the iodine numbers of the solid acid fractions. The solid acid fractions of the hydrogenated cottonseed oil samples contain iso-oleic acid, and therefore it is not possible to measure the contaminating unsaturated liquid acids by the iodine numbers.

From extensive experiences with the lead salt-ether method, it was assumed that the contaminating unsaturated liquid acids present are equivalent to an average iodine value of 5; consequently this figure has been deducted from the iodine numbers of the solid acid fractions (1 to 4 inclusive) so that the results by this procedure would be comparable with those by the lead salt-alcohol methods.

An examination of the table of results shows that the percentages of solid acids obtained by the lead salt-alcohol method applied to original oil samples agree favorably with the results obtained by the original Twitchell method and by the lead salt-ether method. Subtracting the figure 5 from each of the iodine values of the solid acid fractions separated by the lead salt-ether method from the four hydrogenated cottonseed oil samples, gave the following results:

Sample 1 — 29.5
Sample 2 — 17.7
Sample 3 — 14.6
Sample 4 — 33.2

These figures compare favorably with the iodine numbers of the solid acid fractions separated by the other two methods. This comparison indicates that each method gives a quantitative separation of the iso-oleic acids along with saturated acids.

PERCENTAGES OF SOLID FATTY ACIDS OBTAINED BY DIFFERENT METHODS

Sample	Lead Salt-Alcohol Method Using Oil Instead of Total Fatty Acids		Original Twitchell Method Using Total Fatty Acids		Lead Salt-Ether Method
	Solid Acids %	Iodine No. of Solid Acids	Solid Acids (Calculated to oil basis) %	Iodine No. of Solid Acids	Solid Acids % (corrected)
No. 1 Hydrogenated Cottonseed Oil	40.8	29.7	40.6	29.9	38.0
No. 2 " " "	35.3	16.2	34.8	16.3	36.3
No. 3 " " "	30.7	14.3	31.4	16.3	30.8
No. 4 " " "	37.6	31.3	—	—	36.5
No. 5 Cottonseed Oil (refined)	21.1	1.1	20.8	0.8	21.1
No. 6 Olive Oil	9.7	0.3	—	—	10.7
No. 7 Corn Oil (crude)	8.8	1.6	—	—	9.1
No. 8 Soy Bean Oil (refined)	11.2	1.7	—	—	11.2
No. 9 China Seed Oil[1]	8.2	3.1[2]	—	—	8.1
No. 10 Grape Fruit Seed Oil	25.3	0.3	—	—	26.5

[1] *Oil and Fat Ind.* Vol. 6, No. 9, p. 15 (1929).

[2] The solid acids fraction contained considerable color. The coloring matter may have been responsible for this high iodine number.

Oil Chemists Will Meet at Chicago

Semi-Annual Gathering Planned for November 13 and 14, at Congress Hotel in Midwest Metropolis

PRESIDENT W. H. IRWIN, of the American Oil Chemists' Society has announced that the 1930 Fall Meeting of the Society will be held at the Congress Hotel in Chicago on November 13 and 14. It is expected that this meeting, the first Fall Meeting to be held elsewhere than in New York, will attract a large attendance of members and guests from all sections of the country, as the central location of Chicago makes it a convenient gathering place for oil chemists from the East, the South, the Middle West and the Pacific Coast.

W. H. IRWIN

The Local Committee on Arrangements named by President Irwin includes Messrs. I. J. Vollertsen, A. W. Put'and, L. M. Tolman, J. P. Harris, A. E. King and M. L. Sheely. Under the guidance of the President, this Committee is arranging a program of papers and addresses which will be of interest to all the members and to visiting oil chemists and which is expected to mark a continuation of the rapid development of oil chemistry of the past few years

The first day of the meeting will be devoted to soap and soap product chemistry and Archibald Campbell, Chairman of the Soap Section of the Society, wil preside at this session. The second day's session will give consideration to general phases of oil and fat chemistry and will be presided over by President Irwin.

The Congress Hotel has been designated as Headquarters for the Fall Meeting and the Hotel Management has kindly provided facilities for the Society's Sessions at the hotel. All members and guests are urged to show their appreciation of this hospitality to the Society on the part of the hotel management by registering at the Congress for their stay in Chicago in connection with the Fall Meeting.

Chemical and Apparatus Exhibits

THE Local Committee on Arrangements has invited manufacturers of machinery, supplies, laboratory chemicals and apparatus who supply the oil refining, edible oil products and soap trades to present exhibits of their products in the exhibit room of the Congress Hotel during the meeting, where suitable space will be provided. It is expected that the leading manufacturers of such equipment and supplies will be on hand to display the latest developments in their respective lines, following the custom which was established at the 1929 Fall Meeting in New York.

Entertainment Features

IN ADDITION to the program of scientific papers and addresses the Local Committee on Arrangements is planning a number of visits to various industrial plants of interest to the members and guests in attendance. In addition there will be two football games in Chicago on Saurday, November 15; Universiy of Chicago vs University of Illinois and Northwestern University vs University of Wisconsin. These are both "Big Ten" Midwestern Conference games, rivalry is keen and those attending either game can be assured of a wellspent afternoon. A bowling tournament for members is being planned for the first night of the Meeting, and an informal dinner or luncheon will enable members to get together socially.

Chicago is a splendid city to visit; its industries are flourishing, its progressiveness is outstanding among American cities and its hospitality to visitors is known throughout the world. Whether you have or have not been there before you will derive pleasure and profit from a visit during this coming Fall Meeting of the American Oil Chemists' Society.

The Lipeometer Fat Test

A New Rapid Method for Determining Fat and Oils in Fat Bearing Materials, Press Cake or Refuse

By ROBERT SCHWARZ*

OIL chemists and superintendents of oil pressing plants have for a long time felt the need for and the value of a method whereby it would be possible to rapidly and accurately determine the fat or oil content of their raw materials, press cakes and other waste or by-products. Their discussions have laid stress not on'y on the rapidity of such a desired method but also on the safety, and particularly the accuracy thereof. When large quantities of seeds are handled, small variations become very important.

The purpose of this short paper would not be served by presenting a detailed bibliography or discussion of the various methods which have been presented. It is, however, important to note that in 1908, Chas. H. Herty presented a method which, like our own, based the estimation of cotton seed oil in meal or cake on the drop in specific gravity of carbon tetrachloride when the same was used to dissolve the fat in a weighed sample. Herty used a Westphal balance, prepared detailed tables for the conversion of specific gravity to percentage of cotton seed oil and prescribed methods for standardizing new batches of carbon tetrachloride whose variations in gravity had always to be taken into consideration. This method required considerable manipulation and involved the use of a solvent which is quite volatile, offering the possibility of considerable error due to evaporation of solvent, particularly in warm climates.

Early in 1920 David Wesson proposed a new optical method for determining oil in oil mill materials. The physical property upon which the determination was based, is the refractive index, the solvent halowax, and the measuring instrument, a butyrorefractometer. The Wesson method was studied in detail in the Grain Research Laboratory of the Bureau of Agricultural Economics, U. S. Department of Agriculture, and the results of this research published by Coleman & Fellows, U. S. Department of Agriculture, Bulletin #1471, March 1927. This method unquestionably gives accurate results. It, however, involves considerable preparatory work, the use of a rather elaborate temperature regulating device to be attached to the refractometer, and the standardization of the solvent each time that a new batch is used. An analytical balance is required, and as the determination is made on a 2 gram sample, considerable skill in manipulation is required.

A number of laboratories have developed methods based on shaking out various quantities of material with volatile solvents, filtering off an aliquot into tared fat flasks, evaporating off the solvent and weighing the fat recovered. These methods require about one hour per determination, and from the point of view of practicability present the requirement of analytical balances and volatile, generally inflammable, solvents. These objections have mitigated against their wide adoption for plant work. These methods furthermore have not shown themselves sufficiently superior to that of the American Oil Chemists' Society to warrant their consideration as alternates for official procedure.

A study of the methods available readily disclosed that a rapid, simple and safe procedure could not be based upon an extraction and subsequent separation of the fat to be determined. A physical property of the oil to be determined had to be used. As the specific gravity of freshly pressed oils in general varies between fairly narrow limits, and as specific gravity spindles which are sufficiently delicate to be accurate to one unit in the fourth place can be obtained, there was sought a solvent of high specific gravity which was non-poisonous, non-inflammable and at the same time very active as regards dissolving fats from raw materials. The basis for such a solvent was found in ortho-dichlorbenzol, which, with its high boiling point of 179 Deg. C. and its specific gravity of over 1.30 is well suited for this pur-

* *Contribution from Research Department, Schwarz Laboratories.*

Presented before the Twenty-first Annual Meeting of The American Oil Chemists Society, New Orleans, La., May 9, 1930.

pose. Of course, commercial ortho-dichlorbenzol invariably contains some of the para-isomer and frequently small amounts of trichlorbenzol. It therefore became necessary to develop a new analytical solvent of definite composition and specific gravity. The solvent has an unusual affinity for practically all fats and oils. The change in gravity when different amounts of the various fats, particularly cotton seed oil, are added, presents a straight line graph.

In order to develop a method that would be practical for plant control, all delicate balances and fine measurements were eliminated. The first work was done with samples of 33⅓ grams and later the 100 gram sample was adopted. A Torsion balance with dash pot is amply sensitive for weighing out the sample. Using 100 grams of sample, 1% of oil becomes 1 gram of oil. Therefore, the minimum amount of solvent which could be used to float an average-sized specific gravity spindle or hydrometer was determined and a chart prepared by adding to this quantity of solvent from 1 to 13 grams of pure cotton seed oil. The specific gravities at 20° C. were carefully noted, checked and these gravities then used as the basis of a hydrometer whose scale readings are given in percentages of cotton seed oil instead of specific gravities. The inevitable factor of change in specific gravity with variation in temperature required automatic compensation in order to make this method simple and certain. The curves for variations in specific gravity due to changes in temperature above and below 20 deg. C. were carefully prepared and correction scale prepared for a thermometer in the body of the hydrometer which for simplicity and identification has been named the *Lipeometer*.

Early tests showed that when 100 grams of material are treated with about 600 grams of solvent and the mixture heated until the solvent fumes slightly, the mixture then cooled and after filtration through a Büchner Funnel, tested with the Lipeometer, the fat content found in most instances agreed closely with the results obtained by the A.O.C.S. method. When, however, the material under examination was rather finely ground, the results were found to be from 0.3 to 0.5% high. A further study showed that if the meats or meal were ground to from 60 to 80 mesh and the heating of the mixture and solvent and sample entirely omitted, the results agreed very closely with those of the official method used by the American Oil Chemists' Society. Table I gives results on 11 samples which were tested by both the Official and by the Lipeometer method.

TABLE I

SAMPLE	Method of A.O.C.S.	"Lipeometer" Rapid Method Ground to 60-80 Mesh
A	4.05 %	4.1 %
D	8.2 %	8.1 %
C-12	6.25 %	6.15%
C-16	6.02 %	6.1 %
55	5.981%	5.9 %
C-13	6.21 %	6.2 %
B	4.55 %	4.4 %
50	6.0 %	6.0 %
51	5.65 %	5.75%
C-14	6.25 %	5.95%
C-15	6.17 %	6.1 %

The maximum difference between A.O.C.S. and Lipeometer method is 0.3%, the minimum 0.00% and the mean error 0.09%. The Lipeometer tests were carried out on samples that had been previously ground through a Straub laboratory mill.

The final procedure developed is described briefly as follows: An aluminum beaker plus stirring rod of standardized weight, plus the sample are balanced against a tare weight, using the Torsion balance. This procedure automatically weighs out a 100 gram sample. The tare is changed for one which balances the beaker, the rod, the sample and the required quantity of solvent. As soon as solvent needed to balance the new tare has been added, the mixture is thoroughly stirred, allowed to stand 5 minutes, stirred again and then filtered through a Büchner funnel into a special filtering cylinder, using suction. The filtration requires but a few minutes. The filtrate is thoroughly mixed with an aluminum stirrer and the Lipeometer then inserted and after the solution has come to equilibrium, the reading is taken, using the upper meniscus. At times stratification of the solvent containing the dissolved oil requires that the Lipeometer be moved up and down in the solution several times before reading is taken. In the event that the temperature of the solvent, or particularly the room temperature is materially above 20 deg. C. the filtering cylinder is placed in a cooling jar and the temperature of the filtered solution reduced to about 20° C. by circulating cold water from a faucet. This requires but a few moments and does not materially add to the length of time required for the complete test, which, including the grinding of the sample, should not exceed 20 minutes. Where several samples are taken at a time, it is possible to have three and possibly four results within one-half hour.

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Cottonseed Sample Preparation

Simple and Ingenious Machine Suggested to Facilitate Quartering and Separation of Seed Sample

By G. S. MELOY, *Chairman**

THE difficulty in reducing or quartering a sample of cotton seed and maintaining its representativeness is doubtless fully appreciated by those analysts whose duties impose upon them the task. Some idea of these difficulties can be understood by those who are not familiar with cotton seed when we consider that fully matured ginned cotton seed of different varieties and growths vary in weight from 3 or 4 to 15 or 18 grams per hundred; that the residual fiber, chiefly fuzz, attached to the seed coats varies from absolutely denuded or slick seed to seed with 15 or 20 per cent of fiber; that the seed are not always fully developed so that the seed coats may be filled with kernels or they may contain only shrunken kernels or rudiments of kernels; that the seed are frequently aborted in early stages of development. In the usual method of quartering a sample of cotton seed, the sample is mixed in a cone-shaped pile, pressed down and quartered; opposite quadrants are remixed, piled and quartered until opposite quadrants are of the size desired for analysis. In this method it is practically impossible to maintain a thorough mixture or composite pile. Seeds of the different characters tend to segregate at every effort to mix the sample.

In the author's experience in cotton breeding work it frequently became necessary to count out one hundred seeds as a basis for calculating the relative value of selections or to rate the behavior of varieties grown under new environment. For this purpose it was the practice to spread the sample of seed from which the lots of 100 were to be counted, into a ribbon of a single seed in thickness and from three to five seeds in width. Thus laid out the countings could be made very rapidly. In his experience in quartering samples of cotton seed for chemical analyses it occurred to him that if the sample, instead of being piled, was spread out into a long narrow ribbon of a fairly constant width and thickness, and should this ribbon of seed be split longitudinally, the probabilities would be that the two halves would be of the same composition of variables. With this thought in mind, the cotton seed sample reducing or quartering machine illustrated was devised. The two narrow belts "A" provide the means for drawing out the sample of seed into a continuous ribbon to be split by the divider "B", before falling into properly placed receiving boxes. The hopper "C" provides sufficient accommodation so that the sample to be divided may be fed into it by the handful and so maintain a constant supply on the belts. Small tacks set in echelon protrude through the belts. These tend to drag the seeds forward and to center the stream of seed toward the divider. However, it was found that this tendency was not positive enough to assure exact division, but that when baffles "D" were placed in position and properly adjusted by the set screws "E" divisions were exceedingly accurate. Divisions of 1,000 grams of seed have been made, the two halves of which did not exceed 1.5 grams in error. In trial samples of known mixtures of slick, semi-slick and fuzzy seed, divisions have been made that were accurate within an error of not more than six slick seeds.

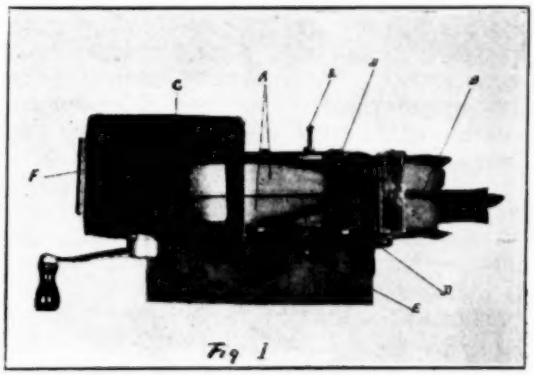

Fig. 1. COTTON SEED SAMPLE REDUCER
Top view, cover of conveyor removed to show adjustment of baffles.

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* *Committee on Methods of, Sampling and Analyzing Cottonseed, U. S. Department of Agriculture.*

Uses of Fats Affected by Their Chemical Structure

Address Before John Cass Technical Institute, London, as Reported by The Chemical Age

By T. P. HILDITCH

THE utilization of fats in edible products (butter, margarine, cooking fats, confectionery), for soap making, in paints and varnishes, or for other purpose, involves at the present time the consumption of several million tons per annum of natural fats, and the existence of very large industries, employing large numbers of people, which are dependent on the natural fats as raw materials.

There are many different kinds of fats and fatty acids found both in the fruit of plants and in animals, some solid, some liquid and some semi-solid. Of the solid fats, some are hard and brittle; others, even though they melt at a higher temperature, are softer and more plastic in texture, and of the liquid fats (or oils) some will keep more or less unaltered on storage, whilst others become gummy or thicken on exposure to air. These varying properties make some fats especially suitable for butter or lard substitutes or for other edible ends; other fats make useful soap-making material, and yet others ("drying" oils) are adapted for use in the preparation of paints.

A number of more or less rapid analytical tests have been devised by means of which those engaged in the production of any of these commodities can readily assess the utility of any given natural fat for their particular service, but technical analytical methods of this nature do not, as a rule, tell us very much about the chemical structure of the fats. Nevertheless the usefulness of a particular fat depends ultimately on its fundamental chemical structure and it is, therefore, desirable to have as complete a knowledge as possible of the latter.

Industrial Uses of Natural Fats

UP TO the present some 1,400 different natural fats have been examined, of which number perhaps between 100 and 200 find technical use in one form or another. It has been known for more than a century that all fats are mixtures of chemical compounds known as glycerides, formed by union of glycerol with three groups or molecules of fatty acids, but it is only comparatively recently that the quantities and kinds of fatty acids characteristic of particular fats have received detailed attention, whilst the manner in which they are bound up with glycerol is only at present becoming clearly understood.

The reasons for this apparently slow development of knowledge do not lie in any particular complexity of the fatty acids (which, as organic chemical compounds go; are rather simple in structure), but in the fact that nearly 40 different fatty acids have been observed in one or other of these fats; that the number of different fatty acids in an yone fat is never less than 3 or 4 and may be as many as 15; that in the great majority of cases two or three different fatty acids are linked to the same glycerol molecule, so that the whole fat or mixture of glycerides is very complex; and that the different fatty acids are built up for the most part on very similar lines and are therefore not easy to separate quantitatively.

On the other hand, the specific utility of a fat depends ultimately on (*a*) the kinds and proportions of the individual fatty acids present in combination with glycerol and (*b*) the manner in which these are linked up with glycerol as natural glycerides. Consequently, there is considerable incentive to investigators in both these directions. Much progress has been made in the last 10-20 years in accumulating detailed analyses of the fatty acids present in numerous fats, and reliable data of this kind for 150 or more fats (including most of those in common use) are now available. The second problem (the structure of the glycerides themselves) is much more difficult, but definite advances have recently set in in this field.

The subject of fats is full of paradoxes. The constituent fatty acids are so simple in structure as to have proved relatively uninteresting to organic chemists, yet by reason of their simplicity and similarity and their complex mode

of union with glycerol in nature, the resulting fats are usually most complicated mixtures which have proved singularly difficult for the chemist to unravel. Again, in the vegetable kingdom, which, from a biological standpoint, is in many ways simpler in functional mechanism than the animal, we find numerous specialized fatty acids which are never, or rarely, encountered in animals, and also the structure of the glycerides themselves in seed-fats appears to be oriented on more well defined and less haphazard lines than in many animal fats. Furthermore, the most complex forms of animal life appear to produce, or at all events to accumulate, fats containing the simplest group of fatty acids met with in nature, namely, palmitic, stearic, oleic and linoleic acids.

Comparison of Classifications

IT IS very interesting to classify the detailed data available at present for the fatty acid compositions of different natural fats according to the predominance, in a broad way, of one or more particular fatty acids, and to compare the resulting list with the classification adopted by the biologists for the plants or animals in which the fats originated. It is found that, so far as the existing information takes us, there is a remarkable connection between the two classifications.

Thus, in the fats present in seeds of various kinds, two acids, lauric and/or myristic, are especially prominent in seeds of the *Palmae, Myristicae* and *Simarubacae;* erucic in *Cruciferae;* petroselinic in *Umbelliferae* and *Araliaceae;* Chaulmoogric and hydnocarpic in *Flacourtiaceae;* arachidic and lignoceric in *Sapindaceae* and certain members of *Leguminosae;* whilst a few acids are even almost peculiar to certain genera or species — elaeostearic to *Aleurites Fordii* and *Montana,* ricinoleic to *Ricinus communis,* tariric to *Picrammia* species. The majority of seed-fats, however, have only four predominating acids — palmitic, stearic, oleic and linoleic; yet in these cases stearic is present in greater amount than palmitic in seed-fats of five botanical families, whilst the relative proportions are reversed in 13 other botanical families. In 11 other families, finally, the proportion of palmitic and stearic acids is very low, and oleic, linoleic (and linolenic) acids predominate. This group includes nearly all the more familiar "drying" oils used in the paint and varnish industries.

Again, in the animal kingdom, many of the common fish oils and even those of the ordinary whales contain similar mixtures of fatty acids, which are entirely differentiated from any vegetable or non-marine animal fatty oils by the presence of large quantities of peculiar unsaturated acids known as palmitoleic, doleic, cetoleic, clupanodonic, etc. The only exceptions met with so far are certain abnormal types of oil, such as that of the sperm whale, which contains higher fatty alcohols in place of glycerol, and those of the shark and ray group, the liver oils of which contain large amounts of hydrocarbon as well as fatty oil. In these cases the fatty acid composition, although still different from that of fats of non-aquatic origin, is also different from that of the average fish, the oil of which is practically all fatty or glyceridic in nature.

Finally, as already stated, the fats of carnivora, herbivora and man contain, for the most part, the simple mixtures of palmitic, stearic, oleic and linoleic acids.

To a large extent, therefore, and in general terms, the composition of the fatty acids of the natural fats is characteristic for particular biological families, genera, or even species; at the same time, within certain limits, there is variability in the actual amounts of any one acid present in a fat from the same species, such variations probably depending on factors such as climatic conditions, life history and habits, stage of development of the organism, etc.

The great differences in kind and amount of the various fatty acids present in these natural materials are not accompanied by parallel differences in the manner in which they are assembled into glycerides. So far as our present information goes (and it is still in a rudimentary condition) the structure of the glycerides seems to be determined solely by their place of origin in the plant or animal and to be of two sharply defined kinds:—

(*a*) Glycerides in which the fatty acid molecules are woven into combination with glycerol in such a way that a maximum even distribution of the fatty acids among the glycerol molecules has taken place. So far this has only been observed in vegetable seed fats, but within this category it appears to be a rule almost without exception.

(*b*) Glycerides in which the fatty acids are thrown into combination with glycerol in a more fortuitous fashion and, apparently, much on the lines on which probability would determine the combinations in which a number of differently coloured balls could be withdrawn, haphazard, three at a time, from a bag in which a large number were present. Animal body and milk fats, pericarp or fruit flesh oils of plants, and artificially prepared fats made by heating fatty acids and glycerol together fall into this class.

Experimental Data Lacking

IT SHOULD be noted that experimental data is yet lacking on this point for many fats, especially those of animal organs such as liver, etc., oils.

Sufficient is already known, however, to indicate the considerations, which, for example, broadly determine the characteristic consistency of butter-fat as contrasted with that of coconut fat or cacao butter. To simulate completely the physical texture of butter is not only a matter of having approximately the same proportions of mixed faty acids present, but of combining these in a similar manner to that of milk-fat, so that there are about 30 per cent. of fully saturated glycerides present, with a molecular ratio of about equal parts of saturated and unsaturated acids in the mixed saturated-unsaturated glycerides. Whilst it is probably economically unnecessary closely to approach this ideal, it may yet be pointed out that fats present in animal tallows are built up on these lines. So to a certain extent is palm oil, whilst coconut oil and palm kernel fats or soft oils such as cottonseed oil belong definitely to the other evenly distributed class of glycerides.

On the other hand, certain fats of which cacao butter is an outstanding example, contain substantial amounts of only three fatty acids, oleic, palmitic and stearic, and their proportions are not very far from equimolecular. Consequently, by reason of the "even distribution rule," they contain large proportions of oleopalmitostearin (as has been experimentally proved), and thus come closer in physical properties to those of an individual compound; they have a low but sharp melting point, and, for fats, are exceptionally hard and brittle. They are thus especially suited for use in confectionery.

In another class of oils, the "drying" or paint and varnish oils, both the nature of the fatty acids and the structure of the glycerides play an important part. All highly "unsaturated" fatty acids absorb oxygen from the air very readily, and become converted into thick, almost solid, gelatinous or horny substances. If the acids are extremely unsaturated, as in fish oils, the products are gummy and thick and do not cohere readily into solid films, but with less unsaturated acids, especially mixtures of linoleic and linolenic, the products of oxidation or "drying" are transparent coherent solid films.

Thus fatty oils containing mixed glycerides of these acids are most suited for paint oils, and such oils are found in various seeds, such as linseed, poppyseed, perilla, walnut seed, hemp seed and others. These seed oils, however, invariably also contain combined oleic acid, which is not a "drying" agent, its state of unsaturation being too low. Owing, however, to the operation of the "even distribution" rule in glyceride structure, it is probable that, so long as the more unsaturated acids are present well in excess of the oleic acid, each molecule of the latter is partnered by two of the more unsaturated components. In these circumstances the final oxidized product is a suitable solid film, in spite of the presence of more or less oleic acid in combination.

Choice of Raw Material

TO TRADES where the fats are broken up into their constituent acids and glycerol—soap-making being by far the most important—the structure of the original fat is of no great interest, and the main concern is the nature and the amount of the fatty acids present.

The variety of fatty acid mixtures in the hundreds of natural fats which are available (though only a fraction have yet been commercially exploited) may be found to satisfy the needs of practically all the industries concerned. Two ultimate developments of these lines of work suggest themselves: (*a*) To collect detailed fatty acid compositions of all fats likely to be of any industrial use, and, where necessary, to obtain sufficient analyses to cover any likely range of variability within the same species or variety of plant or animal; (*b*) to determine the particular strains or varieties of plant species which will give the best yield of fatty oil of desired composition under given conditions of climate, soil, etc. Combined efforts by chemists and agriculturists on scientific lines should, in the course of time, make great improvements in the standardization of fats as raw materials.

Cultivation of Oil-bearing Plants

INDICATIONS of what is likely to happen in this manner are afforded by comparison of plantation coconut and palm kernel and palm oils with the native-produced fats from the corresponding wild trees; these are already matters of course, but the scientific cultivation of other oil-bearing plants is also coming into being in various parts of the world, notably of late years in the United States, where soya beans, *Aleurites* (China wood) trees and *stillingia* oil trees are already in bearing on a practical scale.

Beginnings are also being made in parts of the British Empire, especially Malaya, Kenya and West Africa, and experimental crops of

(*Turn to page* 347)

The Rapid Determination of Total Fat

Variation in Specific Gravity of a Solvent Made Basis of Analysis of Seeds or Press Cake for Oil Content†

By Clarence P. Harris*

THE importance of the determination of total fat in fat- or oil-bearing materials has long been recognized by the converters of these products into marketable materials. The residues remaining from the expression or extraction of oils and fats are almost invariably of lower value than the oil which is usually the prime product. The value of the oil-bearing raw product is, of course, dependent upon its oil content, and this may be determined within a reasonable period without causing delay or loss to the vegetable oil producer. The amount remaining in the residue (press cake) indicates the efficiency of the expression process and tells the operator whether any of the product is being needlessly lost. It is obvious, however, that the efficiency of a pressing must be known as quickly as possible in order to prevent avoidable loss. Many methods have been devised for the estimation of "total fat." Some are very slow, a few are quite rapid, but all are subject to the objection that a skilled chemist is required to obtain significant results. It, therefore, was suggested that methods which were rapid, accurate, and above all, sufficiently simple that non-technical persons could operate them, would meet with welcome by oil and fat producers.

Such methods have been devised. The time required for their operation varies from ten minutes with cottonseed meal to thirty-five minutes with the more finely ground chocolate products. The accuracy is at least as great as that claimed for the Official methods and the simplicity is such that a laboratory boy or factory girl can become adept after a few hours practice. Before describing one of the new methods it might, perhaps, be of interest to recall some of the older methods for this determination. The most widely used method for chocolate products, an Official method, consists in mixing the sample with an equal weight of sand, transferring to an extraction thimble, and extracting with ether (petroleum ether is preferred to ethyl, as the latter extracts substances other than fats) into a weighed extraction flask for five hours, distilling off the ether, drying the extract first in an oven, then in a desiccator, and weighing the fat. This procedure in one form or other has been, and still is the standard procedure. With only two exceptions the idea has always been to *isolate* the actual fat present and weigh it. Welman's[1] variation consists in suspending the material in water before the ether extraction. Hanus[2] makes use of a dilute alcoholic and ammoniacal suspension before the ether extraction. He prefers a mixture of the petroleum fraction and the ethyl ether. Kreutz[3] melts the sample with chloral hydrate to facilitate extraction. The most exact results are supposed to be given by Heller's[4] method, which consists of a twenty-four hour extraction in a Soxhlet apparatus.

Gephardt speeded up these extraction methods, finding that good results are obtained by the use of only 1 gram of sample and by a very short extraction and washing of the material on a Gooch crucible. The method requires a skilled operator. Gerber and Kooper[5] modified the Babcock method for milk. Salts of hydroxybenzoic (salicylic) acid are used to free the fat from extraneous material, and butanol is used as a "clarifying agent." This method seems to give excellent results with milk, cream and other dairy products, but, possibly because the proteins are different in chemical nature from the casein of milk, thus having an altered solubility in the salicylates, the method seems inapplicable to chocolate products. At any rate the results are neither consistent nor reliable with this sort of material. A method devised by Hughes[6] is popular in some circles because of its rapidity. It consists of successive extractions with ether of the fat-bearing substance, centrifuging the ether layer after each extraction. Low results are obtained if the extraction has not been complete, and, on the other hand, high results are likely if the centrifuging of the

* Consulting Chemist, New York City.

† *The method described in this paper was invented and developed by the writer while associated with the Schwarz Laboratories, Inc., New York.*

finely divided particles is less than perfect. A variation of the extraction method consists of the S. B. Phillips[6a] procedure, using trichlorethylene. A larger sample (8-10 gm) is taken and an aliquot of the extract is evaporated and weighed in the usual manner. The method is fairly rapid, but the technique is involved. Lepper and Waterman have recently modified the Official method described above and use a Knorr extraction apparatus. The sample is introduced into the Knorr tube, stirred with petroleum ether, and washed ten times. The method has been made official and appears to be more rapid than the earlier official procedures. Heiduschka and Muth[7] have devised glass apparatus for extraction and evaporation methods which shorten the number of manipulations and transfers of solution. The Gooch crucible is designed to serve also as a weighing flask for the sample, and the distilling flask is also fitted with covers and is sufficiently small to act as a weighing flask for the extracted fat.

Richter[8] and Herty[9] broke with tradition so far as total fat estimation is concerned and devised methods which do not depend upon weighing the fat actually present in the sample. They recognized that solution of a second substance in a liquid alters the physical properties of the liquid, and usually in direct proportion to the amount of substance dissolved. Therefore, if the change in that property can be sufficiently accurately measured, the amount of added substance can be determined. Richter's method depends upon the change in refractive index, Herty's upon the change of specific gravity. Richter used as dissolving liquid a mixture of ether, alcohol and trisodium phosphate. The substance whose fat content was to be determined was extracted with this mixture, the clear solution, obtained after warming, adjusted exactly to a definite temperature (17.5°C.) and examined under a Zeiss refractometer. From the refractive indices of solvent, solution and the pure fat, the amount of fat present in solution and, consequently, the amount present in the original sample may be calculated. One difficulty with this method lay in the very great volatility of the ether and alcohol of the solvent. Evaporation of these substances during the operation will render this method inaccurate. To overcome this objection, Wesson[10] proposed the use of "Halowax" a trade name for chlorinated naphthalenes. As certain of these products, impure monochlor compounds, are liquids, they can be used instead of the original mixture of Richter. Halowax is non-volatile and otherwise suitable for this method, but the commerical product varies in composition and properties. The refractometer method has been further elaborated by Coleman and Fellows[11] to include a number of fat-bearing materials. Before using this method the Halowax must be standardized, i.e., a table showing the variation of refractive index with increasing percentages of the oil or fat must first be developed before the particular batch of solvent may be used. According to Coleman and Fellows "It is necessary to prepare for each new lot of the solvent a standard conversion table for each kind of oil-bearing material on which the test is to be made." Furthermore, for certain materials, such as chocolate liquor, an involved process of preparation is necessary. This substance must be grated, melted, chilled, and grated twice before the analysis can be run. The temperature of the solution must be carefully adjusted before the refractometer reading is taken. However, when all these precautions are taken, a skilled operator can obtain results in very short intervals.

Herty's[9] method consists of the solution of the fat by means of carbon tetrachloride, and the determination of the fat by the use of a Westphal balance on the resultant clear solution. Due to its volatility, this solvent will inevitably cause great difficulty, as evaporation of the solvent during the operation will give high results. Here again, the specific gravity of the solvent will vary over an appreciable range, and in contact with various materials will hydrolyze and form various degradation products which very much alter the gravity. Consequently the solvent requires frequent checking and standardization and the operation requires considerable skill to avoid a change in specific gravity during the testing interval. The Westphal balance is not without objection.

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(To be continued)

Mayonnaise Convention Planned for Atlantic City

Producers of Salad Dressing Specialties to Hold Fifth Annual Gathering at Haddon Hall, October 27-29

FRANK HONICKER, Executive Manager of the Mayonnaise Products Manufacturers Association of America, Incorporated, has issued the formal call for the Fifth Annual Convention of the Association, to be held at Haddon Hall Hotel, Atlantic City, October 27, 28 and 29, 1930.

C. P. McCORMICK

The Mayonnaise Manufacturers Association in the short term of five years since its organization, has proven itself one of the country's fastest-growing and most progressive trade associations. The aims of the association are best defined by the words "mutual fairness" and "co-operation." Recognizing that their products can be marketed upon their merits, the members of the association, through their Trade Practice Committees, have discouraged the methods of cut-throat competition through selling below actual cost, free deals, rebates and other unfair practices.

The Association has established a Research Fellowship in the Department of Agriculture Laboratories at Washington, for study of ways and means of improving the quality of mayonnaise and related products, reducing losses from freezing, rancidity or other spoilage. The results of the Research Fellow's work will be published and will result in benefit to all manufacturers of mayonnaise, not only those who support the work as members of the Association.

The plans for the Fifth Annual Convention include business sessions on each of the Convention's three days, addresses by prominent speakers, and round-table discussions by the members, of conditions in the industry.

In the President's Letter discussing the forthcoming Annual Convention, President C. P. McCormick writes the members as follows:

"The paramount issue before manufacturers of mayonnaise today is 'Is the Industry making money and is every manufacturer prospering from conditions as they are?' We feel that there are very few, if any, mayonnaise manufacturers that are making a justified profit today. There is only one way to be assured of such profits, and that is, to pack 'quality' merchandise of the highest type and merchandise it properly. This is a job today in the day of cheap price goods, free deals, cut prices and 'what-not.' We notice however that certain brands are gradually winning in many markets. In almost every case, we find that the cheapest price merchandise seems to be losing more than it is gaining. It's a 'funny' thing, too, when a man puts a cheap price on himself and his merchandise, people think of him as a cheap man, marketing a cheap product, and his business slips because of this lack of respect and lack of faith in his merchandise. It sells easiest at first but it is hard to keep sold."

All manufacturers of mayonnaise and allied products, whether members of the Association or not, will be welcomed at the Fifth Annual Convention at Atlantic City. The Officers of the Association are: President, Chas. P. McCormick; Vice-President, Wade E. Utley; Secretary, Anna Schlorer Smith; Treasurer, Wm. R. McKeldin. The Executive Manager is Frank Honicker and the Permanent Executive Offices are at 1500 Walnut Street, Philadelphia.

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Cottonseed Samples

(*From Page* 337)

The curved plate "F" (Fig. 1.) in the rear of the hopper beside preventing any back dropping of seed, apparently tends to cause a rolling of the seed in the hopper and possibly results in some mixing of the seed. As to size, the belts are ⅞ inch in width, the pulleys 3 inches in diameter and 7½ inches from center to center. The tacks protrude ⅛ inch through the belts. We operate the crank at a fairly constant rate of about 75 rpm. The apparatus is exceptionally simple and was constructed in this office by one of my assistants, Mr. F. S. Hubbard, from scrap material with the use of hack saw, a metal drill, pair of tin snips and a soldering iron.

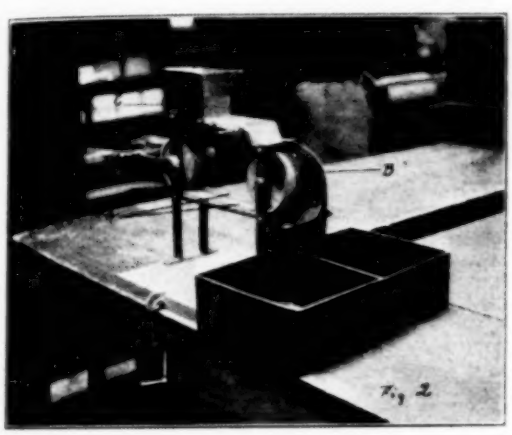

Fig. 2. COTTON SEED SAMPLE REDUCER.

Side view—showing machine in position for operation.

The machine is peculiarly adapted to the division of samples of cotton seed sent in under the revised rules of the National Cottonseed Products Association. These samples under the new rules are to weigh 1,000 grams. One-half or 500 grams is to be retained as a referee sample, a single division on the machine. Again dividing one half of the original sample gives two parts of 250 grams, a second division of one of these portions results in two parts of 125 grams each. One of these is available for Free Fatty Acid determinations and dividing the other results in two portions of approximately the size required under the rules for moisture and oil determinations.

The Lipeometer

(*From Page* 336)

The method as presented, has been thoroughly tested not only on a number of samples but on various portions of the same gross sample. The results are within 0.1 of 1% in the hands of various analysts. It is perhaps needless to point out that the simplicity of the manipulation permits the work to be done by a trained technician.

Acknowledgment is hereby made to Dr. C. P. Harris, of our Research Laboratory, for his work in the development of the process, and to his assistant, Mr. Manuel Horwitz, for his co-operation.

Fat Composition and Uses

(*From Page* 341)

China wood (tung oil) trees, rubber seed, perilla and some other plants are being systematically tested. Yet, bearing in mind the wide climatic and agricultural resources of the Empire and the opportunity for opening up fresh tracts of cultivated land on these lines, progress within the Empire is all too slow, and the efforts already made by the Government Departments concerned to promote these developments deserve encouragement, but also require to be intensified and fortified by the close co-operation of chemists, biologists and agricultural experts.

Tentative Official Oil Trier

THE Tentative Official Oil Trier (sampler) adopted at the meeting in New Orleans this year can be obtained complete from the Refinery Supply Company, Tulsa, Okla. at the price of $35.00.

The committee suggests that all companies who have any use for oil sampling devices, purchase at least one of these Tentative Official Triers in order to enable us to collect data and opinions during the coming season. At the next meeting of the Society, this matter will again come up for definite adoptions or recommendations.

We very much appreciate your cooperation in connection with the above and wish to refer you to the Sampling Committee's report printed in the May issue of *"Oil and Fat Industries,"* also the report of Uniform Methods Committee, *"Oil and Fat Industries,"* June, 1930. Further details concerning the sampler may be obtained from the chairman.

V. SERBELL,
P. O. Box 740,
Portsmouth, Va.

Notes of the Industry

Olive Oil Tariff Hearings

Pursuant to the Resolution passed by Congress on July 22, authorizing a special investigation of the differences in costs of production of domestic and foreign olive oil; the U. S. Tariff Commission announces that public hearings will be held at the office of the Commission at Washington, or at such other place as may be later designated, covering the differences in costs of production of, and all other facts and conditions affecting the production of Olive Oil, being wholly or in part the growth or product of the United States, and of and with respect to like or similar articles wholly or in part the growth or product of competing foreign countries.

Oleomargarine Production at Bergen, Norway

According to a report from Consul Pierce at Bergen, the oleomargarine industry in the Bergen consular district enjoyed an average year in 1929. The two largest oleomargarine factories at Bergen, namely, "Ornen" and "Bjorgvin," published their annual accounts in January and paid a ten per cent dividend to their shareholders. On the other hand, the smaller factories did not register any profit owing to the keen competition from the trust companies and the larger factories. At the close of the year there was reason for believing that the smaller factories would not be able to continue unless arrangements were made as to mutual selling prices in this industry. The oleomargarine trust, operated from Holland, has forced the Norwegian manufacturers into considerable reduction in prices. As butter is very expensive, Norway is a good market for the margarine industry. In this connection it is interesting to note that farmers manufacturing butter sell their products in town and buy oleomargarine for their own consumption. The majority of all raw materials for the oleomargarine industry are imported, the United States being the principal source of supply. Cottonseed oil, lard, and oleo stock are imported from the United States and smaller quantities are purchased from England. Norway's total production of oleomargarine in 1929 was 42,000,000 kilos of which about 12,000,000 kilos are estimated to originate in the eleven factories located within this district.

Canadian Bean Oil Plant

Reconstruction of the Thorold, Ontario, plant which has been acquired by Anglo Canadian Seed Products, Limited, is going forward rapidly, it being expected that operations will begin early in September. T. Walsh is president of the new company, which will produce various soya bean oils. The beans for the first year's run will be imported from England, but officials of the company say experiments have shown they can obtain future supplies from crops grown in the immediate vicinity of the new factory. Thomas Kavanaugh will be assistant general manager of the plant, Mr. Walsh being in personal charge. Joseph Kavanaugh will be secretary and treasurer. Production will begin with a working force of 40 men and will be expanded as demand grows.

Lower Coconut Oil Freights

Cut in the western railroad freight rate on coconut oil from the Pacific Coast to Kansas City has been permitted by the Interstate Commerce Commission. The commission on August 14 gave the carriers permission to make a 60-cent rate from the Pacific Coast to Kansas City, as compared with the present rate of 75 cents, and as against the rate of 55 cents sought by the railroads. In their request for lower rates, the railroads indicated that if granted permission they would file new schedules of 60 cents to St. Louis and 65 cents to Chicago.

Linseed Oil Production

Twenty-five mills which crushed flaxseed during the quarter ending June 30, 1930, report a crush of 203,568 tons of seed and production of 130,863,405 pounds of linseed oil, according to preliminary census data collected by the Department of Commerce. The final production report for the first quarter was 145,969,802 pounds of oil from 233,036 tons of flaxseed. The figures for the second quarter compare with 278,933 tons of seed crushed and 187,018,538 pounds of oil produced in the corresponding quarter in 1929, 269,022 tons of seed and 179,532,207 pounds of oil in 1928, and 250,970 tons of seed and 167,232,121 pounds of oil in 1927.

Stocks of flaxseed at mills June 30 amounted to 65,173 tons, compared with 100,928 tons on

the same date in 1929, 84,964 tons in 1928, and 97,731 tons in 1927. Stocks of linseed oil reported by the crushers were 71,222,982 pounds March 31, compared with 83,544,918 pounds on the same date in 1929, 140,055,105 pounds in 1928, and 105,492,012 pounds in 1927. The record of imports of flaxseed during the quarter is not yet available, but up to and including June 17 119,649 tons were imported. The amount for the entire quarter in 1929 was 254,171 tons, in 1928 154,502 tons, and in 1927 213,303 tons. Imports of linseed oil to June 17 were 412,257 pounds, compared with 6,415,055 pounds in the entire quarter in 1929, 44,934 in 1928, and 388,652 in 1927.

Approval has been given by the Norwegian government to the proposed merger of De Nordiske Fabriker A/S (De-No-Fa), Fredrikstad, (hydrogenated oil), and the Lilleborg Fabriker A/S, Oslo (soap), in spite of the fact that the semi-official "Trust Kontrolraadet" advised against it. This means that the Unilever concern will have practical control of the margarine and soap industry in Norway, together with the usual provisions, including Norwegian management, Norwegian workers, Norwegian deliveries, etc., and that the companies bind themselves to maintain their production and export in that country.

The South Texas Cotton Oil Company has reported net income of $237,438 for the year ended April 30, 1930, which was sufficient to cover the preferred dividends and equal to $2.21 a share on the common stock. This was compared to a net income of $444,190 or $4.19 a common share, reported for the previous fiscal year. The company's balance sheet as of April 30, 1930, showed current assets of $1,970,703 and current liabilities of $524,160, which was a ratio of 3.7 to 1.

Coconut interests in the Philippine Islands have organized an association to be known as the Philippine Coconut Industries Association. Its aims are similar to those of the Philippine Sugar Association, according to information sent to the Department of Commerce by the trade commissioner at Manila.

This is the first attempted organization of the various interests in the Philippine coconut industry. Because of its representation of all interests concerned, it is expected to achieve definite results. Coconut planters, copra crushers, American oil mills, copra exporters and manufacturers of desiccated coconut all have representatives in the directorate of the association. It is an incorporated body, but not a stock organization.

Ravages of the leaf miner pest have occasioned considerable concern to coconut planters in the Philippines, and a congress of planters was called to discuss measures for the effective control of the pest. The attendance was disappointingly small and indicative of the disinterestedness of many of the planters in the islands.

New Books

THE CONDENSED CHEMICAL DICTIONARY, Compiled and edited by The Editorial Staff of the Chemical Engineering Catalog. Second Edition, Thomas C. Gregory, *Editor,* Isabelle M. Welch, *Assistant Editor.* Published by The Chemical Catalog Company, 551 pages, $10.00: A old friend in a new dress, the second edition of the well-known Condensed Chemical Dictionary shows many improvements over the former edition, both in material and make-up. The extension of encyclopaedic data on many of the items listed in the dictionary increases the usefulness of the volume immeasurably. The quality of paper and type are much improved, and the addition of a thumb-index will assist users to quickly locate any data sought.

A CHEMICAL DICTIONARY, By Ingo W. D. Hackh, *Professor of Chemistry, College of Physicians and Surgeons, San Francisco.* P. Blakiston's Son & Co., 790 pages, $10.00. This first edition of Professor Hackh's Chemical Dictionary appears to be a well-prepared comprehensive volume, giving quickly the salient facts concerning the chemical elements and compounds, as well as the major materials occurring in nature or prepared synthetically. Chemical theories are tersely explained, and a particularly interesting feature is the inclusion of biographical material concerning prominent living chemists as well as those of the past. The book is well illustrated, with portraits, cuts of apparatus, and charts. The presentation of graphic formulae of many organic products is an especially valuable feature.

ABSTRACTS

David Wesson, *Abstract Editor*

Stable high chlorinated fish oils of good adhesive and weather resisting properties and which may be used in paints are obtained by chlorinating fish oil until chlorine is no longer absorbed and then passing air or inert gas into the oil at 70° for several hours, followed by treatment with air containing ammonia for a short time and addition of a small proportion of monoethylaniline. British Pat. No. 323,801.

Materials such as fish, fish waste, fats, seeds or garbage are subjected to mechanical impaction and disintegration, oils and fats are melted from the material, and the partially disintegrated mass is partially dehydrated to a point where the moisture content of the solid residue is reduced to from 5 to 20% while maintaining the material at temperatures of about 43-100°. The dehydrated solid residue is then subjected to continuous expression. U. S. Pat. No. 1,760,059.

Experimental data on the butter of *Dumoria africana* is said to show conclusively that the butter is essentially a mixture of the glycerides of stearic and oleic acids. It also contains small quantities of the glyceride of palmitic acid and of an acid-alcohol. No fatty acid higher than stearic is present. This butter has been suggested as a possible new source of pure stearic acid. *Mat. Grasses* 21,8701-3(1929).

Among papers presented before the Division of Agricultural and Food Chemistry at the Meeting of the American Chemical Society at Cincinnati, September 8-12, are the following of particular interest in the chemistry of oils and fats:

1. The chemical and physical characteristics of the expressed and the residual oil of the Brazil nut have been determined. The low acidity of both types of oils suggests the probable absence of any very active fat-splitting enzymes in the nut. The reported presence of stearin, palmitin and olein has been confirmed. To this list have been added myristin and linolein. The percentage composition of the residual oil was found to be as follows: myristin, 1.79; palmitin, 13.55; stearin, 2.58; olein, 55.64; linolein, 21.65; unsaponifiable matter, 0.68; residues and undetermined, 4.11. H. A. Schuette, Ralph W. Thomas and Mabel V. Duthey, *University of Wisconsin.*

2. Of the terms used to designate the more or less elastic mass resulting from the interaction of sulfur monochloride and fatty oils, such as caoutchouc surrogate, rubber substitute, vulcanized oil and white factis, the latter is probably most common. The discovery of this reaction some eighty years ago is probably traceable to accidental origins in that a French chemist, Nickles, having sealed with olive oil the stopper of a bottle containing sulfur chloride, observed that a gummy substance had formed where the vapors of the sulfur chloride had come into contact with the oil. Ellery H. Harvey and H. A. Schuette, *University of Wisconsin.*

For the separation and determination of solid fatty acids in edible fats, 2.5 grams of the fat to be studied is saponified at the boiling point for ten minutes under a reflux condenser with 1 cc. of 50 percent potassium hydroxide solution and 25 cc. of 95 percent alcohol. In the case of oils with solid unsaturated fatty acids, 1 gram is taken, and a 5 percent alcoholic solution of palmitic acid substituted for the alcohol. The boiling is continued after addition of 100 cc. of a solution containing 50 grams of lead acetate and 5 cc. of 96 percent acetic acid in 1 liter of 80 percent alcohol (by volume), and 5 cc. of 96 percent acetic acid until the precipitate is completely dissolved; 20 cc. of boiling water are added, and the mixture is allowed to cool slowly overnight to 22°C. The filtered precipitate is washed with 50 cc. of 70% (by volume) alcohol, and extracted with 3 cc. of 96% acetic acid and 100 cc. of the hot lead acetate solution. The hot solution is shaken with 15 cc. of hot water, and the pure lead salts of the solid fatty acids separated by filtration on the following day, washed with alcohol as before, dissolved in 5 cc. of dilute nitric acid (sp. gr. 1.2) added. Warm water is added carefully, and the acids separated by heating at 98°C. until they form a clear layer on the surface. They are then filtered from the cooled solution, washed till neutral and dried in the air, and finally in the oven. *Z. Unters. Lebens.*, 59, 237-58 (1930).

Fat and Oil Data for Second Quarter 1930

Production, Consumption, Exports and Imports with Factory and Warehouse Stocks June 30, 1930

WASHINGTON, D. C., August 2, 1930.—The Department of Commerce announces that the factory production of fats and oils (exclusive of refined oils and derivatives) during the three-month period ended June 30, 1930, was as follows: vegetable oils, 415,118,884 pounds; fish oils, 8,418,245 pounds; animal fats, 540,625,525 pounds; and greases 92,621,101 pounds; a total of 1,056,783,755 pounds. Of the several kinds of fats and oils covered by this inquiry, the greatest production, 412,102,760 pounds appears for lard. Next in order is cottonseed oil with 153,012,620 pounds; linseed oil with 130,863,405 pounds; tallow with 126,770,103 pounds; coconut oil with 78,592,145 pounds, and corn oil is next with 27,688,508 pounds.

The production of refined oils during the period was as follows: Cottonseed, 212,731,656 pounds; coconut, 78,592,145 pounds; peanut, 2,324,267 pounds; corn, 21,253,897 pounds; soya-bean, 1,655,179 pounds; and palm-kernel, 4,064,845 pounds. The quantity of crude oil used in the production of each of these refined oils is included in the figures of crude consumed.

The data for the factory production, factory consumption, imports, exports and factory and warehouse stocks of fats and oils and for the raw materials used in the production of vegetable oils for the three-month period appear in the following statements:

PRODUCTION, CONSUMPTION, AND STOCKS OF FATS AND OILS

(In some cases, where products were made by a continuous process, the intermediate products were not reported.)

KIND	Factory operations for the quarter ended June 30, 1930 Production (pounds)	Consumption (pounds)	Factory and Ware'se stocks June 30, 1930 (pounds)
VEGETABLE OILS: [1]			
Cottonseed, crude	153,012,620	243,908,759	22,750,308
Cottonseed, refined	212,731,656	299,748,753	393,306,235
Peanut, virgin and crude	6,412,830	3,201,375	936,370
Peanut, refined	2,324,367	2,389,887	3,045,463
Coconut, or copra, crude	78,592,145	161,076,823	160,193,421
Coconut, or copra, refined	65,232,138	69,377,285	18,452,184
Corn, crude	27,688,508	27,704,035	10,363,766
Corn, refined	21,253,897	2,154,737	9,906,383
Soya-bean, crude	2,904,958	4,649,798	12,399,723
Soya-bean, refined	1,655,179	2,674,852	3,007,892
Olive, edible	—	705,130	6,016,230
Olive, inedible	—	2,115,545	1,660,933
Sulphur oil, or olive foots	—	10,141,222	21,158,691
Palm-kernel, crude	—	14,140,171	16,972,130
Palm-kernel, refined	4,064,845	4,371,667	708,362
Rapeseed	—	2,805,429	5,453,289
Linseed	130,863,405	104,276,122	108,758,224
Chinese wood or tung	—	25,611,885	34,149,504
Chinese vegetable tallow	—	2,023,937	5,811,140
Castor	11,188,514	4,807,360	12,256,718
Palm	—	55,170,434	42,321,729
All other	4,455,904	7,974,174	14,668,819
FISH OILS: [1]			
Cod and cod-liver	263,953	3,353,634	10,025,972
Menhaden	1,273,176	3,481,515	2,486,379
Whale	2,590,125	19,560,200	71,979,351
Herring, including sardine	3,567,638	12,791,003	79,721,903
Sperm	399,375	172,415	1,190,789
All other, (including marine animal)	323,978	2,002,000	9,196,244
ANIMAL FATS:			
Lard, neutral	7,942,926	3,690,583	6,084,630
Lard, other edible	404,159,834	4,507,051	92,927,341
Tallow, edible	9,208,365	6,501,720	4,359,390
Tallow, inedible	117,561,738	129,553,263	121,498,332
Neat's-foot oil	1,752,662	2,196,971	1,612,140

[1] The data of oils produced, consumed, and on hand by fish oil producers and fish canners were collected by the Bureau of Fisheries.

PRODUCTION, CONSUMPTION, AND STOCKS OF FATS AND OILS (Continued)

KIND	Factory operations for the quarter ended June 30, 1930 Production (pounds)	Consumption (pounds)	Factory and Ware'se stocks June 30, 1930 (pounds)
GREASES:			
White	16,871,594	12,884,613	10,963,528
Yellow	19,567,627	10,932,076	9,657,110
Brown	11,148,624	15,269,692	13,163,366
Bone	6,985,221	288,523	3,805,695
Tankage	12,081,213	476,245	4,347,506
Garbage or house	21,145,786	16,907,338	20,834,308
Wool	1,464,885	1,272,928	3,925,556
Recovered	756,191	605,792	1,118,416
All other	2,599,960	948,403	2,588,245
OTHER PRODUCTS:			
Lard compounds and other lard substitutes	283,298,650	360,721	24,011,497
Hydrogenated oils	142,054,897	140,304,164	20,310,220
Stearin, vegetable	4,652,120	4,921,469	2,689,544
Stearin, animal, edible	14,423,812	12,172,396	6,656,946
Stearin, animal, inedible	3,009,920	5,475,088	4,604,691
Oleo oil	31,567,768	11,497,889	19,888,162
Lard oil	6,031,540	3,037,837	5,047,157
Tallow oil	2,493,443	2,385,411	2,494,634
Fatty acids	36,145,199	34,839,975	9,501,197
Fatty acids, distilled	12,269,847	9,293,301	2,501,701
Red oil	9,824,245	6,745,960	6,837,705
Stearic acid	7,653,074	2,247,010	6,022,060
Glycerin, crude 80% basis	35,895,607	40,908,921	13,841,262
Glycerin, dynamite	11,455,398	7,261,451	9,925,377
Glycerin, chemically pure	18,636,935	2,128,121	9,536,365
Cottonseed foots, 80% basis	44,026,791	42,296,486	65,048,955
Cottonseed foots, distilled	23,181,524	20,932,213	6,702,422
Other vegetable oil foots	12,246,179	6,884,202	1,852,793
Other vegetable oil foots, distilled	281,205	1,372,189	1,027,948
Acidulated soap stock	11,453,866	12,110,649	21,113,874
Miscellaneous soap stock	389,830	1,614,635	1,702,877

RAW MATERIALS USED IN THE MANUFACTURE OF VEGETABLE OILS

KIND	Tons of 2,000 pounds Consumed March 31 to June 30	On hand June 30	KIND	Tons of 2,000 pounds Consumed March 31 to June 30	On hand June 30
Cottonseed	454,544	77,295	Flaxseed	203,568	65,173
Peanuts, hulled	7,751	542	Castor beans	12,753	4,063
Peanuts, in the hull	2,012	50	Mustard seed	193	2,036
Copra	61,544	28,698	Soya-beans	10,358	7,275
Coconuts and skins	460	57	Olives	—	—
Corn germs	44,930	203	Other kinds	4,238	1,482

IMPORTS OF OIL SEEDS, QUARTER ENDED JUNE 30, 1930

KIND	Pounds	KIND	Pounds
Cottonseed	110	Poppy seed	489
Castor beans	16,034	Perilla and sesame seed	4,327
Copra	53,843	Other oil seeds	3,622
Flaxseed	121,876		

IMPORTS OF FOREIGN FATS AND OILS, QUARTER ENDED JUNE 30, 1930

KIND	Pounds	KIND	Pounds
Animal oils & fats, edible	50,892	Palm-kernel oil	2,856,550
Whale oil	63,859,980	Sesame oil	4,785,836
Cod oil	3,246,390	Vegetable tallow	6,283,786
Cod-liver oil	7,528,230	Vegetable wax	579,866
Other fish oils	7,416,525	Carnauba wax	2,232,782
Tallow	199,246	Peanut oil	437,677
Wool grease	3,597,773	Rape (colza) oil	2,396,775
Grease and oils, n.e.s. (value)	417,481	Linseed oil	412,441
Olive oil, edible	29,967,706	Soya-bean oil	1,044,117
Tung oils	33,530,460	Perilla oil	4,740,078
Coconut oil	82,400,990	Other expressed oils	1,565,993
Sulphur oil or olive foots	22,473,810	Glycerin, crude	3,483,688
Other olive oil, inedible	2,167,141	Glycerin, refined	615,272
Palm oil	59,727,542		

EXPORTS OF FOREIGN FATS AND OILS, QUARTER ENDED JUNE 30, 1930

KIND	Pounds	KIND	Pounds
Animal fats & oils, edible	—	Palm & palm-kernel oil	296,339
Fish oils	412,042	Peanut oil	5,689
Other animal oils & fats, inedible	6,783	Soya-bean oil	392,760
Olive oil, edible	40,679	Other expressed oils & fats	150,030
Tung oil	1,910,001	Vegetable wax	177,458
Coconut oil	742,758		

EXPORTS OF DOMESTIC FATS AND OILS, QUARTER ENDED JUNE 30, 1930

KIND	Pounds	KIND	Pounds
Oleo oil	11,482,598	Other animal greases & fats	15,536,422
Oleo stock	1,620,471	Cottonseed oil crude	2,904,073
Tallow	2,221,281	Cottonseed oil, refined	3,220,424
Lard	169,272,811	Corn oil	139,059
Lard neutral	3,242,504	Vegetable oil lard compounds	1,765,289
Lard compounds, containing animal fats	583,124	Other edible vegetable oils and fats	762,459
Oleo & lard stearin	951,658	Coconut oil	7,013,912
Neat's-foot oil	333,724	Linseed oil	508,084
Other animal oils, inedible	362,275	Soya-bean oil	1,349,729
Fish oils	255,658	Vegetable soap stock	4,558,444
Grease stearin	438,111	Other expressed oils and fats, inedible	749,030
Oleic acid, or red oil	501,390	Glycerin	98,089
Stearic acid	126,010		

Olive Foots Producers in Distress

Owing to the sharp decline in prices of olive oil foots, Italian producers are in a critical position, and recently a meeting of the principal producers, together with soap manufacturers, was called under the auspices of the National Federation of Chemical and Allied Industries in order to discuss the situation and adopt measures to relieve producers, according to U. S. Trade Commissioner Humes at Rome. The selling prices of olive oil foots have registered a drop from $19.39 per 220 pounds to quotations around $9.96 per 220 pounds. During the meeting the soap manufacturers were, not unnaturally, in favor of allowing matters to take their course, but producers of olive oil foots, however, succeeded in having the following motions voted, whereby the Government is requested to take steps to make the use of a certain proportion of olive oil foots obligatory in the production of soap. Furthermore, official intervention was declared desirable in bringing producers of olive oil together to apportion production qualities and to close down those mills which are inefficiently operated.

A reduction in the carload freight rates on inedible tallow and grease from Kansas points to Chicago, St. Louis and points East of the Mississippi is requested by Southwest Rendering Co., Hutchison, Kan., Wichita Dessicating Co., Wichita, and Topeka Rendering Works, Topeka. The companies have filed a complaint with the Interstate Commerce Commission.

Whaling rights along the entire western coast of Mexico have been granted to a citizen of the United States in a concession issued by the Ministry of Agriculture and Development. Monthly payments of 600 pesos are required by the concession, and a bond of 20,000 pesos. The concessionaire will employ six vessels and will operate a floating factory for the extraction of whale oil.

Motions of the American Wholesale Grocers Association and the National Wholesale Grocers Association to dismiss the petitions of Swift and Co. and Armour and Co. for modification of the "Packers consent decree" of 1920 were overruled in the Supreme Court of the District of Columbia.

Two ocean-going whale oil factories have been ordered of the Furness Shipbuilding Company, England, by Norwegian whaling interests. The ships will be the largest of their kind and of about 21,500 deadweight tons, with cargo capacities of 95,000 to 100,000 barrels of whale oil and a daily production capacity of about 1,500 barrels of oil.

Referee Applicant

Mr. Clinton Morris, of Morris-Flinn Company, Macon, Georgia, has applied to the American Oil Chemists' Society for Referee Chemist certification on all products covered by the Rules of National Cottonseed Products Association. (*Second Publication*).

OIL & FAT INDUSTRIES

The Editor's Page

Business Standards

IN THIS issue we are privileged to publish in full the text of the Code of Ethics proposed for adoption by the National Association of Soybean Oil Manufacturers. In reading over the Code one cannot escape being impressed by a sense of pride that the business of producing oils has made rapid strides in recent years toward the goal of uniformity of uprightness and fair dealing. The soybean oil manufacturers are not alone in striving to place their business dealings upon such a plane of integrity that they will command the respect of all who have occasion to contact them.

The National Cottonseed Products Association in its present form represents the culmination of years of effort on the part of far-sighted leaders of the Interstate and Texas Crushers' Association directed toward the promotion of uprightness and the entire elimination of chicanery in the cottonseed milling industry of this country.

The records of the past have not been entirely enviable insofar as the vegetable oil milling trades have been concerned. Not in every community has the oil mill owner or manager been considered an example of fair dealing for his fellow townsmen. In some of the oil milling industries the general estimate of those conducting the industry has been sometimes quite the reverse. The writer was once informed by a banker in one of our largest cities —"I have been forced to conclude that everybody in the vegetable oil milling business is afflicted with myopia whenever it is necessary to observe the rights of anyone else."

Oil milling is an honest, respectable business and industry. It has attracted to its ranks many business men of first-class ability and the most sterling probity. During long years of unselfish striving through the channels of the cottonseed milling trade associations those men have endeavored to preserve for the entire industry a reputation for fairness and uprightness in business dealings which would be comparable with their personal records. That they have succeeded and are continuing to succeed is evidenced by the adoption of such Codes of Ethics as those of the National Cottonseed Products Association and the National Association of Soybean Oil Manufacturers.

Soon there will be no place whatever in this country for the oil miller who cannot subscribe to such a Code, or who, subscribing to it, promptly files his adherence in that convenient corner of his mind marked "Dormant Matters".

Chemistry — Ancient and Modern

WE HAVE recently received from the Department of Chemistry and Chemical Engineering of Virginia Polytechnic Institute, a copy of an attractive little circular giving the list of 92 Chemical Elements, (Gaseous, Liquid, Metallic, Crystalline and Amorphous), with the name, atomic number, symbol, atomic weight, melting point, and year of discovery of each, (excepting Number 85, which, while its existence is predicted by the Periodic Law, still remains undiscovered).

This little table, with its cryptic symbols and numerals, holds between its lines all the romance of man's progress on earth. The reader's attention is first arrested by the extreme small number of the elements which were discovered before the time of Christ. A check of the list shows that in the first several million years of his existence on this sphere man had become acquainted with just nine of the elementary substances, those of course which he found in their native state, or which he was able to recover by smelting with crude fires. The nine elements he knew were carbon, sulfur, iron, copper, silver, gold, tin, mercury and lead.

The table reveals further that the study of chemistry, or alchemy, awakened no interest in mankind for more than fourteen centuries after the beginning of the Christian era, its first unfoldings being manifested in the discovery of antimony and bismuth in 1450. Followed about three hundred more years of darkness, or semi-darkness, marked only by the discovery of zinc, in 1520, phosphorous in 1669 and arsenic in 1694.

About the middle of the eighteenth century, less than two hundred years ago, during the time which marked truly the beginning of

modern science, pure and applied, man commenced to master the secrets of chemistry and as a consequence, was able to life the curtain which had concealed from him the existence of many of nature's elementary substances. These were the days of Newton, Brandt, Cronstedt, Cavendish, Priestley and Lavoisier, and the world's knowledge was enriched by the discovery of cobalt, 1735; nickel, 1751; fluorine, 1771; platinum, 1741; hydrogen, 1766; nitrogen, 1772; and chlorine and oxygen, 1774. The infant science now commenced to grow and the nineteenth century marked progress with which we are all familiar.

The Periodic Law leaves but one element undiscovered, so that the chemist of the future must content himself with devising new uses of the known elements, with delving more deeply into the laws of physical chemistry, and advancing the art of synthesis for the production of new utilities for his fellow men.

Baled Copra vs. Copra in Sacks

A series of experiments has been conducted in British Malaya recently under the supervision of the Department of Agriculture of that country to determine the advantages resulting from the shipment of copra in the form of bales in place of sacks. The method pursued in preparing the copra for shipment in this manner was to cut the copra into eight pieces as uniform in size as possible. The copra which of course had been dried was then put into a rectangular container of steel equipped with sides and ends that could be removed after compression, which was accomplished by means of hydraulic pressure, had been completed. The copra was then in the form of a bale and the sacking which had been inserted in the container before the copra was introduced was in place ready to be brought together for stitching after which sealing wire was placed around the bale. Experiments demonstrated that the cost of packing material per English hundredweight was reduced from 38 cents to 23 cents and that 3400 cwt. of copra per hour could be baled as against average performance of 1200 cwt. of copra when sacked, 8 cwts. of stowage are saved on a vessel through the lessening of the bulk of the copra in baled form. There was no loss of oil during the compression of the copra or later while the copra was en route to overseas destination in the hold of the vessel. The facility with which copra bales are stacked minimizes the danger of self-heating and better circulation of air is gained thereby. Again, the free fatty acidity in the copra when baled, only increased from .7 of 1 per cent. to 1.5 per cent. whereas the control shipment of sacked copra showed an advance in acid content of from .18 of 1 per cent. to 2.25 per cent. between the time of loading and arrival of steamer at destination.

Shortening and Oil Prices

Prices of shortening and salad and cooking oils on Thursday, Aug. 28, 1930, based on sales made by member companies of the Shortening and Oil Division of the National Cottonseed Products Association, were as follows:

Shortening

	Per lb.
North and Northeast:	
Carlots, 26,000 lbs.	@10¾
3,500 lbs. and up	@11
Less than 3,500 lbs.	@11½
Southeast:	
3,500 lbs.	@10¾
Less than 3,500 lbs.	@11¼
Southwest:	
Carlots, 26,000 lbs.	@10½
10,000 lbs. and up	@10¾
Less than 10,000 lbs.	@11
Pacific Coast:	@11½

Salad Oil

North and Northeast:	
Carlots, 26,000 lbs.	@10½
5 bbls. and up	@10¾
1 to 4 bbls.	@11½
South:	
Carlots, 26,000 lbs.	@10¼
Less than carlots	@10¾
Pacific Coast:	@10¼

Cooking Oil—White

⅛c per lb. less than salad oil.

Cooking Oil—Yellow

¼c per lb. less than salad oil.

When soap made from sperm head oil by saponification with caustic soda at 150° C. is distilled at 200° C. and 13 millimeters pressure, wax alcohols, chiefly oleyl and cetyl, are obtained. The residue from distilling the wax alcohols have no fishy smell and are soluble in warm water.—*J. Soc. Chem. Ind. Japan* 32, Suppl. Bin. 253-4 (1929).

Sulfonated naphthalene derivatives and castor oil are the basic materials for many "wetting out" agents in use in the textile industries. One such agent consists of a solution of highly sulphonated castor oil in turpentine. —*The Melliand* 1, 96-8, 843-8 (1929).

American Cherry Kernel Oil

(A Contribution from the Oil, Fat and Wax Laboratory, Bureau of Chemistry and Soils, U. S. Department of Agriculture)

By George S. Jamieson and Samuel I. Gertler

OWING to the very rapid expansion of the cherry canning industry in the United States in recent years, attention is being paid to the utilization of the separated pits. Heretofore they have been considered valueless and have in many cases been a source of expense due to the charges for hauling them away from the plants. At present it is estimated that more than a hundred million pounds of sour cherries are canned annually in the States of Michigan, New York, and Wisconsin. Also, several other States are now producing and canning sour cherries. For those not familiar with the canning industry, it may be added that sweet cherries are usually packed without the removal of the pits. The pits, which amount to from 12 to 15 per cent of the fruit, consist of about 28 per cent kernel and 72 of shell. The oil content of the kernels ranges from about 32 to 40 per cent. If all the pits separated at the canning plants were utilized for oil, the annual production would amount to more than four million pounds of oil.

Although Rabak *(U. S. Dept. Agric. Bull. 350)* showed in 1916 that a valuable oil could be obtained from cherry pits, no attempt was made to express the oil until 1926. Since that time increasing quantities of the oil have been obtained, and in 1929 the production amounted to about 68,000 pounds. It appears probable that the present production will be doubled within the next year or two. The oil is being used in the manufacture of various cosmetics, for some pharmaceutical preparations and as a salad oil, for which purposes it appears to be well adapted. Contrary to Lewkowitsch's *(6 Ed. Vol. 2,* p. 286*)* statement in regard to the European cherry oil, the American product is reported to have good keeping qualities.

In many respects, cherry kernel oil is similar to that from almond, apricot and peach kernels, but has a somewhat different composition as shown by its higher iodine number, which is 110-122, whereas the range of the iodine number for these other kernel oils is from 93 to 109. Previous to the present investigation only the characteristics of cherry kernel oil have been recorded and these were chiefly of European oils, the majority having been determined on small samples of oil, extracted by solvents from the kernels of various kinds of cherries. In certain parts of Europe cherry kernel oil has been prepared on a small commercial scale for many years. There, the first pressing from sound kernels is used for edible purposes, and that obtained from the second pressing or from damaged kernels is used in making soap or as an illuminant in rural districts.

In view of the growing interest in this country both in the production and the utilization of cherry kernel oil, this laboratory has undertaken a more comprehensive study of it than heretofore attempted. For this purpose, samples of both crude and refined oil were kindly furnished by the Cherry Oil Company, Sturgeon Bay, Wisconsin. This firm cracks and separates the kernels from the shells by mechanical means instead of resorting to the procedure which is common practice, particularly in Europe, that is, separating by means of a saline solution, the specific gravity of which is adjusted so that the shells float and the kernels sink. The practice of this firm obviates several steps, namely, the use of a flotation bath, and the washing and drying of the separated kernels, which is a decided advantage over the older procedure. The kernels are crushed and the oil expressed by means of the expeller. As the crude oil has a slight but characteristic odor and flavor it is refined and deodorized before being placed upon the market.

Rabak *(loc. cit.)* has shown that the press cake contains a glucoside of the amygdalin type similar to that found in almond, apricot, and peach kernels, and that the volatile oil obtained, after hydrolysis of the glucoside, is similar to that from the other kernels. The experiments made by Rabak in 1915 indicated that about 1 pound of volatile oil could be obtained from 100 pounds of press cake. Further study will be made to determine the quantity of volatile oil available in the press cake from the modern oil expeller and whether or not it would be profitable to undertake its recovery. The press cake, which contains 30 per cent or more of proteins, is stated to be used in mixture with other feeding stuffs as a cattle food. Also, it can be used as a fertilizer.

Characteristics of the Oil

THE crude oil is dark golden yellow. It has a distinct nut-like odor and a slightly bitter taste. The refined oil, which is of a pale straw color, has a pleasant bland flavor.

The following color readings (Lovibond Scale) were made in each case with a column of oil 5.25 inches in depth: Crude oil, 35 yellow and 4.5 red; refined oil, 15 yellow and 1.5 red.

The chemical and physical characteristics of the samples of oil are given in Table I. The percentages of saturated and unsaturated acids were determined by the lead-salt ether method *(J. Assoc. Offic. Agric. Chemists, 11,* 303, 1928*)*, and corrections were made for the small quantity of unsaturated acids that is precipitated and weighed with the saturated acid fraction. The percentage of unsaturated acids has also been corrected for the unsaponifiable matter that remains with the unsaturated acid fraction.

TABLE I
CHEMICAL AND PHYSICAL CHARACTERISTICS

	Crude Oil	Refined Oil
Specific Gravity 25/25°	0.9176	0.9183
Refractive index at 25°	1.4742	1.4740
Acid value	4.39	0.09
Iodine number (Hanus)	118.7	115.8
Saponification value		190.7
Reichert-Meissl value		0.3
Polenske number		0.2
Unsaponifiable matter, %	0.66	0.5
Saturated acids, corrected, %		7.7
Unsaturated acids, corrected, %		87.
Iodine number of unsaturated acids		127.9

Unsaturated Acids

FROM the iodine number of the oil and the percentage of unsaturated acids, the iodine number of the latter was calculated to be 133.1. This value was used in the calculation of the oleic and linolic acids in the oil with the following results:

	Unsaturated Acids %	In Oil %	As Glycerides %
Olcic Acid	53.88	46.85	48.9
Linolic Acid	46.12	40.11	41.9

Saturated Acids

THE saturated acids which were separated from the oil by the lead-salt ether procedure were esterified with absolute methyl alcohol in the presence of dry hydrogen chloride gas *(Jour. Amer. Chem. Soc. 1920, 42,* 1200*)*. The dry solvent free esters (94.3 grams) were fractionated under a pressure of 8 mm. from a 500 cc. Claisson distilling flask. The four fractions as well as the undistilled residue were redistilled from a 150 cc. Ladenburg fractionation flask. The six fractions which were obtained were analyzed, and their composition was determined as previously described *(J. Amer. Chem. Soc. 46,* 775 [1924]*)*. The results given in Table II were calculated from the analytical data obtained.

TABLE II

Acids	Acids in Oil %	Acids as Glycerides %
Myristic	0.19	0.2
Palmitic	4.04	4.2
Stearic	2.79	2.9
Arachidic	0.72	0.7

The acids were recovered from the methyl ester fractions and the undistilled residue by saponifying them with alcoholic potash and decomposing the soaps with hydrochloric acid. The acids were collected and completely separated from the potassium chloride and the excess of hydrochloric acid by remelting them several times with water in the usual manner.

Myristic, palmitic, stearic, and arachidic acids were isolated from various fractions by fractional crystallization from ethyl alcohol. Myristic acid was obtained from the first fraction; palmitic acid from fractions 1, 2 and 3; stearic acid from fractions 3, 4 and 5; arachidic acid from fractions 5 and 6, and the residue. The identity of the acids was established by their melting points and by observing whether or not these melting points were lowered when they were mixed with equal quantities of the respective acids the composition of which had been determined by elementary analysis. In no instance was there observed any depression of the melting point. The acids isolated from the fractions in each case confirmed the deductions previously made from the mean molecular weight of the saturated acid esters.

The composition of the oil in terms of glycerides is given in Table III.

TABLE III
THE PERCENTAGES OF THE FATTY ACIDS AS GLYCERIDES

Glycerides of	Per Cent
Oleic Acid	48.9
Linolic Acid	41.9
Myristic Acid	0.2
Palmitic Acid	4.2
Stearic Acid	2.9
Arachidic Acid	0.7

Summary

THE characteristics and the percentages of the fatty acids in cherry kernel oil have been determined. The oil contains 87 per cent of unsaturated acids and 7.7 of saturated acids.

(Turn to Page 387)

Oil Chemists' Chicago Meeting

Plans Progressing Rapidly for Instructive and Enjoyable Sessions to be Held in Midwest Metropolis in November

PLANS for the 1930 Fall Meeting of The American Oil Chemists' Society, to be held at the Congress Hotel, Chicago, November 13 and 14, are maturing most satisfactorily. W. H. Irwin, President of the Society, advises that a number of prominent speakers have consented to address the Meetings and that the scientific papers already offered will prove of great interest to all members in attendance.

The Soap Section, in particular, will be well represented, and the fact that Chicago is the center of some of the largest soap industries of the country, will make a visit to the meeting of value to every member of the Society's Soap Section, and every other soap chemist.

As announced in the September issue of *Oil & Fat Industries*, the Local Committee on Arrangements is preparing for a series of exhibits by manufacturers of laboratory apparatus and chemicals, and the Committee reports that numerous exhibitors have already arranged for space in which to display their wares.

The entertainment features are well in hand, and particular emphasis is being placed upon a bowling tournament, an innovation in entertainment at any of the Society's gatherings. The bowling tournament will be under the direct supervision of a sub-committee of the Arrangements Committee, John P. Harris being Chairman of the sub-committee. The tournament is planned for the evening of November 13th.

Five fine alleys on the Roof Garden of The Stevens Hotel have already been reserved for Thursday evening, 8 P.M. for this event. Three five man teams have already entered and two more teams or ten more single entries can be accommodated in the space already reserved. Larger accommodations will be secured if necessary. We show herewith the Trophy Cup donated by the Industrial Chemical Sales Co., Inc. for this event and there will also be a prize for the highest three games rolled in competition, whether as member of a team or as an individual entry.

Bowling Trophy Cup
Donated to American Oil Chemists' Society

This will just be a good, sociable, old time bowling get-together. Bowlers will be asked to observe the foul line, but if anyone slides a few inches past it, nobody will worry. At least one prize will be awarded on a "ghost" handicap, so that the bowler appearing on the alleys for the first time will have as much chance of winning as a "shark," (if any), so don't miss this party. It's going to be good.

Mr. Harris, whose address is 205 W. Wacker Drive, Chicago, says, "Snap into it and send in your reservations so that we can provide plenty of alleys to accommodate the crowd."

Vegetable Oils Increase in Foreign Trade Volume

1929 Exceeds All Previous Years in Value and in Preponderance of Imports

By E. L. Thomas*

TOPPING all previous years by a broad margin the foreign trade of the United States in vegetable oils exceeded in value by 25% the commerce of this country in these commodities in 1928 and established a new record high valuation of $105,000,000. The ratio between imports and exports which has increased in recent years stood at 14 to 1 or exactly double what it was in 1924 when the value of our imports of vegetable oils was seven times greater than the exports. A substantial proportion of our augmented imports entered the country during the first six months of last year influenced undoubtedly by the threat of impending tariff legislation. As the possibility lessened of the imposition on many of the oils of higher rates, our vegetable oils imports tapered off correspondingly.

Unquestionably the low price level of oils on the world's markets was also a factor in accentuating the volume of our imports and was likewise responsible in part for the marked slump in our export trade in vegetable oils. Nevertheless the ratio of imports to exports demonstrates most clearly that this country is dependent on extraneous sources of supply and, as illustrated below in the case of cottonseed oil, is retaining at home greater quantities of native oils to meet the growing requirements of domestic consumption.

Declines Registered in Exports

A VERY material decline occurred in our exports of crude cottonseed oil during 1929. As compared with 1928 volume was reduced nearly 55% and value by approximately the same percentage. Although most of our exported crude has been going to Canada for some years past and this trade suffered heavily, a notable decrease took place in exports to Mexico which country's purchases were but one-tenth as large as during the preceding year. Greater available supplies of cottonseed in Mexico offer a partial explanation of the lessened trade with that country last year.

Refined cottonseed oil fell off in value and volume of exports last year about one-third as contrasted with 1928. In general our exports to all countries were in reduced tonnage. Particularly striking in this regard was the contraction of our trading with Mexico last year to 20% of the purchases of that country during 1928. Shipments to Cuba reflected a loss in volume of 28%; Canada 76%; while an outlet in Norway in 1928 for 76,000 pounds disappeared entirely last year. Denmark has not been a buyer of American cottonseed oil for the past several years and Sweden joined her last year while the relative unimportance of the Netherlands as a market was again emphasized by further shrinkage in volume during the year. On the other hand Japan took an increased quantity of refined cottonseed oil as was also the case in 1928. Gains were recorded likewise of approximately 14% over 1928 in our shipments to Panama; 37% in the case of the Philippines and 80% to Germany which offers but a restricted market. The outstanding instance of greater export volume was Peru, showing a three-fold increase last year over 1928.

Coconut Oil

FOR the first time last year our exports of coconut oil surpassed both in volume and value our export trade in crude cottonseed oil and was but a few thousands of dollars less than the total value of crude and refined cottonseed oil exports combined. Little if any coconut oil leaving the country is crude which fact taken in conjunction with the expansion of the vegetable fat compound industries in Mexico and Cuba as well as a greater substitution of coconut oil for other fats in the soup industry of the latter country accounts for the growth of

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TABLE I.

EXPORTS OF VEGETABLE OILS FROM THE UNITED STATES, 1928-1929

	1928		1929	
	Pounds	Value	Pounds	Value
Cottonseed, crude, total	41,126,482	$3,455,567	19,292,131	$1,551,091
Canada	39,084,810	3,282,539	19,009,862	1,521,486
Mexico	2,036,159	172,561	239,840	24,368
Other countries	5,513	467	42,429	5,237
Cottonseed, refined, total	10,575,764	$1,201,158	6,782,890	$836,565
Germany	39,958	4,064	71,580	10,128
Norway	76,567	8,213	—	—
Canada	813,414	84,020	188,909	30,512
Panama	781,603	89,142	893,331	95,673
Mexico	3,456,740	347,499	733,177	91,345
Cuba	1,812,124	182,981	1,305,270	132,060
Argentina	777,491	90,420	756,194	85,512
Chile	484,201	59,562	461,071	55,505
Japan	882,301	135,452	1,025,492	151,793
Peru	78,889	8,931	236,073	29,029
Philippine Islands	169,396	28,040	232,207	34,068
Other countries	1,203,080	162,829	879,586	120,939
Corn oil, total	336,945	$49,616	315,255	$42,329
Canada	30,055	3,392	35,443	3,708
Japan	61,895	10,837	89,996	11,723
Dominican Republic	5,735	784	51,686	5,423
Egypt	21,160	3,989	31,510	5,237
Costa Rica	40,200	5,940	4,975	474
Guatemala	69,111	9,892	18,170	2,158
British Malaya	14,730	2,451	22,116	3,704
Other countries	93,169	12,331	61,359	9,902
Coconut oil, total	24,652,602	$2,088,065	29,532,396	$2,329,340
Canada	8,879,808	772,035	6,961,053	582,275
Nicaragua	219,884	30,374	353,589	29,504
Mexico	13,694,509	1,094,274	15,403,072	1,088,844
Cuba	817,654	83,276	5,535,752	500,270
Japan	164,342	25,212	170,605	22,312
New Zealand	150,259	18,589	157,632	18,597
Other countries	726,146	74,305	950,693	87,538
Linseed oil, total	1,965,147	$227,886	2,208,305	$287,512
Canada	267,677	33,726	289,665	40,339
Panama	262,731	31,140	458,802	63,157
Mexico	164,096	20,691	167,664	23,659
Cuba	460,119	46,933	524,000	60,594
Colombia	147,556	19,408	81,741	10,414
Venezuela	29,022	3,608	76,913	9,274
Honduras	45,262	5,513	85,313	12,233
Other countries	588,684	66,867	524,207	67,842
Soya bean oil, total	7,142,097	$756,094	7,967,396	$767,504
Canada	130,972	12,333	1,472,924	107,588
Cuba	2,731,640	266,271	2,017,765	200,809
British South Africa	567,425	65,320	728,878	71,932
Dominican Republic	1,638,045	166,263	1,790,510	171,819
Argentina	434,100	46,632	433,550	41,966
Other countries	1,639,915	199,275	1,523,669	173,390
Vegetable soap stock, total	7,528,590	$491,987	7,633,394	$544,094
United Kingdom	3,390,138	154,919	3,109,148	160,644
Canada	2,250,137	190,210	2,126,736	176,510
Mexico	515,308	42,844	918,212	86,884
Cuba	687,890	56,057	995,974	82,512
Other countries	685,117	47,957	483,324	37,544
Other vegetable oils, N. E. S.	8,190,180	$709,385	8,126,866	$641,272
United Kingdom	18,775	3,304	293,284	19,345
Canada	6,043,175	518,443	5,908,605	446,882
Mexico	1,673,968	138,025	824,485	68,708
Cuba	163,682	14,649	614,474	52,171
Argentina	89,849	7,540	173,044	15,088
Other countries	200,731	27,524	312,974	39,078

our export trade in this item. Exports to Cuba were roughly six times greater than 1928, reflecting the strides made in the domestic manufacture and sale of vegetable cooking fats in the island republic. Nicaragua was a buyer of 60% more coconut oil from the United States in 1929 than the preceding year. Mexican purchases last year surpassed by 12½% that country's consumption of coconut oil from the United States in 1928. There were slight increases in exports to Japan and New Zealand markets which may hold promise of continued development. Exports to Canada fell off about 22% last year when compared with 1928.

Corn Oil

THE aggregate of our exports last year was about 6% below the total of 1928. Good gains will be observed in the instances of several countries, notably the Dominican Republic, exports in 1929 being nearly ten times greater than 1928. These gains were more than counter balanced by the much diminished export movement to Costa Rica and Guatemala which dropped to 12% and 28% respectively of the volume of the previous year.

Linseed Oil

DESPITE the fact that we were more dependent on foreign seed and oil last year than in a number of years because of the inadequacy of domestic production, our exports of this oil were 12½% larger last year than in 1928. The greater part of our export trade is with Canada and the Central American republics including Mexico. It is apparent from the fact of the increase noted that the shortage of stocks in other quarters whence these several countries are accustomed to draw their supplies may account for heavier exports from the United States. Each country that was a major customer of the United States was credited with a gain, the sole exception being Colombia, with which we did a business 45% less in volume than in 1928.

Soya Bean Oil

AGAIN of 11½% in volume marked our export trade in this oil last year. Offsetting somewhat the rather remarkable rise in Canadian purchases which were nearly nine times in excess of 1928, exports to Cuba dropped 26%. British South African trade showed healthy improvement with a gain of 30%. A smaller increase ruled in the case of the Dominican Republic, while the figure for Argentina reveals practically no change.

Vegetable Soap Stock, etc.

THE United Kingdom maintained first position which it has held consistently for a number of years as the chief consumer of soap stock although the total of purchases of the United Kingdom fell a little short of 1928. Canada, regularly in second place was also a smaller buyer but Mexico came to the United States for 80% more soapstock in volume and Cuba to the extent of 46% more last year as compared with 1928. In the miscellaneous group of oils the total volume and value of which last year was slightly below those of 1928, Mexico gives evidence of a substantial reduction in purchases and there was a lesser loss of business for Canadian account. Cuba, Argentina and the United Kingdom in particular each made decided gains.

(*To Be Continued*)

In an investigation of the chemical structure of iso-oleic acid produced during the hydrogenation of oleic acid, the mixed fatty acids prepared from tsubaki oil were hydrogenated in the presence of 0.5% of nickel at 180°C. for 75 minutes. The product, (iodine value 42.0), was separated into solid and liquid acids by the lead soap and ether process, and the solid acids were fractionally crystallized. The iso-oleic acid thus obtained had an iodine value of 41.3. Examination of the ozonide showed that the acid was a mixture of a considerable amount of 9:10 oleic acid and a small amount of other solid oleic acids (10:11 and 11:12 acids). *J. Soc. Chem. Ind.* Japan, Suppl. Bind. 33, 62B, (1930).

It is said that a first class edible oil can be obtained by pressing at a low temperature, and that in the solvent extraction process the loss of solvents during extraction does not exceed 1%. Modern oil production calls for the installation of both processes in the efficient oil mill. *Chem. Ztg.* 54, 522 (1930).

It is said that in the hydrogenation of oils, with a daily production of fifty tons there are 2,800,000 calories of liberated heat of reaction available for preheating the oil by a countercurrent system before it enters the hydrogenation vessels. *Maslob. Zhirov.* Delo 1929, No. 1, 17-8.

J. Davidsohn, in *Chemische Umschau Fette, Oele Wachse Harze,* 37, 193-6 (1930) reports the conclusion that the Kreis test is an unreliable criterion for rancidity of fats. Davidsohn bases this conclusion upon experiments he has performed on mixtures of rancid fats with fresh fats.

Candellila Wax Offers Profit Opportunities

Recovery of Valuable Wax from Plant Native to Texas and Mexico Still in Condition of Retarded Development

By Geoffrey E. Govier

THE Candellila plant, or *Yerba,* as it is familiarly known to the natives of Southwest Texas and Mexico is an evergreen that grows in wild profusion in the highlands of Southwest Texas, and in several of the northern states of Mexico, particularly Coahuila, Nueva Leon, and Tamaulipas. The candellila plant constitutes practically the only natural source of vegetable wax for the United States, and although we import almost our entire requirements of these waxes, and the prices are consequently high, only half-hearted and crude attempts have been made to recover the wax on a commercial scale from the candellila plant. Through lack of capital and organization, and the use of such primitive and wasteful methods the attempts to establish the industry have practically failed; yet there is every reason to suspect that with careful preliminary study, sufficient capital, efficient organization, and modern equipment, the industry could be successfully established and supply a good proportion of the vegetable wax now being purchased in foreign countries.

Shoe, furniture, floor and other polishes, candles, phonograph records, varnishes, electrical insulating materials, sealing waxes, dental molding compositions, lacquers for metals, sizes for textile fabrics and many other commodities in daily use contain varying proportions of vegetable waxes sufficient to give them the qualities that only this class of wax can impart. To supply such a wide range of industries producing articles in universal demand we must obviously import large quantities of vegetable wax. According to the statistics published in "Foreign Commerce and Navigation of the United States, Calendar Year 1926, Vol. 1," Vegetable Wax, No. 2248, Group 2, weighing 8,234,153 pounds, valued at $2,249,548.00 entered the United States of America during the year 1926.

Varieties of Waxes

THE group of vegetable waxes will of course include carnauba, candellila, japan wax, and perhaps myrtle or bay-berry, and Cochin China or cay-cay; separate statistics are not given for each variety of wax, but the report does state that 730,792 pounds of wax valued at $160,944 came from Mexico, and as candellila is the only variety of vegetable wax exported from that country we are at least certain that that weight of candellila was imported to the United States during 1926. This in itself is not an impressive quantity of this particular variety of wax, yet it would represent a very satisfactory annual output for a modern factory in Southwest Texas. The consumption of candellila wax is no doubt limited by the supply for we import most of our requirements from Mexico, and conditions are such in that country that supplies are irregular and are not dependable. The wax is very versatile in its uses; in many cases can be satisfactorily substituted for the more expensive carnauba wax, and beeswax, and it is reasonable to suppose that if a consistent and uniform domestic supply were available at a price not subject to excessive fluctuation, the demand would very considerably increase.

A word about the candellila plant may not be out of place. As already mentioned, it grows wild and in abundance in the semi-arid highland regions of Southwest Texas; it is not generally to be found on low lying land or in valleys, and the plants requires very little moisture. Cultivation is of course unnecessary, it is purely a weed. Botanically it is known as *Pedilanthus pavonis,* or *Euphorbia cerifera,* belonging to the *Euphorbiacea;* another variety, *Euphorbia antisyphilitica,* also belonging to the *Euphorbiacea,* yields a similar wax. The candellila plant has a tuberous woody root from which spring numerous cylindrical bluish-green stalks, or rod-like branches, from ¼ inch to ½ inch in diameter. It may consist of seventy or

more stalks growing to a height of from two to five feet, and is entirely without leaves. If pulled, the plant reproduces itself from its main root, usually maturing again within from two to five years. It is also stated to reproduce itself from diminutive seeds. The wax is greyish-green in color, and forms a coating on the entire surface of the plant, very apparent to the sight and feel; it may be readily scraped from the surface of the stalks with the thumbnail or a pocket knife. The amount of wax on a plant varies from three and a half to five per cent.

When gathered, the plant is pulled up by the roots with the hands, or cut from the base of the main stem. In some sections the yield per acre will average from one to two tons, including a certain amount of dirt and stones that the plant retains. The plants are tied in bundles and hauled by means of burros, carts and wagons, and in some cases by motor trucks to the wax-recovery plant.

Methods of Recovery

TWO methods have been used to recover the wax; the old process of boiling with steam (Watson, United States Patent 1,042,992 and 1,058,648), and the more efficient solvent extraction process (Sharp, United States Patent 1,081,589) which recovers a far greater yield of wax and is less costly to operate.

The former method is very primitive and inefficient. Wooden or lead-lined vats are used, capable of treating about five hundred pounds of weeds in a batch. A solution of sulphuric acid is used in the vat with a strength of approximately ten per cent, which is heated either with live steam or direct fire. The weeds are tipped onto a net of iron chains which is placed in the bottom of the vat before it is filled. The temperature of the contents is raised to boiling point, and the candellila is kept submerged about six inches below the surface of the boiling solution for about ten minutes, when the molten wax leaves the plant and collects on the surface of the solution. It is then skimmed off and transferred to lead-lined or galvanized tanks. The exhausted weeds are lifted out of the vat with chains, and burned under the boilers. The solution in the vats is changed about twice weekly.

The crude wax is refined by re-melting, and is kept at boiling temperature to remove the water that has been carried over with the skimmed wax. It is later drawn off from the refining tanks into pans where it is permitted to settle overnight. Dirt, twigs, and other foreign matter settle to the bottom of the pan, and when the cakes are removed from these pans the impurities at the bottom of the wax are scraped off and returned for re-settling. The clean cakes, still retaining considerable moisture, are placed in another refining tank and heated until the moisture is reduced to less than one per cent, when the color of the wax is usually a light brown. It is finally drawn off into pans, allowed to set, then turned out and sacked for market. Alternatively, the wax can be bleached by exposure to the sun in thin sheets. By the crude method of recovery described above it is possible to obtain a yield of from only one to one and a half per cent of the refined wax from the plant.

The extraction method should at least double the efficiency of the old method, while the cost of operation will be considerably less. For the extraction method the gathered plants are usually allowed to dry in the sun for two weeks before being prepared for extraction. The candellila is pulverized and placed in solvent tanks containing benzol (carbon tetrachloride can be used), and the wax is dissolved. The solvent-wax solution passes through a filtering medium, and the clear solution is subjected to distillation, thus recovering the solvent for reuse. This cycle is continuously repeated, and if the equipment is efficient, the loss of solvent during the process is very small. The wax residue remaining after distillation of the solvent can be refined if necessary before cooling and breaking up for packing.

Owing to the very primitive methods employed to recover candellila wax, and also perhaps to the fact that other wax bearing shrubs may have been inadvertently gathered with the candellila plant, samples of the commercial wax differ very greatly in constituents and characteristics. Typical results of analyses of the brown and light varieties on the market are given, however:

	Light Quality	Brown Quality
Specific Gravity at 15° C.	0.9930	0.950/0.990
Melting Point	68.4°C.	68/70°C.
Setting Point	63.8°C.	66/68°C.
Acid Value	21.13	13/18
Saponification Value	54.95	50/60

Demand and Costs

IT IS estimated that approximately eighty per cent of the candellila wax consumed by the world's markets is produced in establishments in the vicinity of Nuevo Laredo and Piedras Negras, Mexico, from plants grown chiefly in the state of Coahuila, Mexico. A plant has recently been established in Coahuila, however,

by an American concern, where it is expected to process one hundred and forty tons of weed weekly, and to have a resultant yield of about six thousand pounds of wax weekly.

There is no local consumption of candellila wax in Mexico, and it is all shipped by rail from the producing centers to Tampico for transshipment by vessel to New York and Europe, which are the leading markets for wax.

According to U. S. Consul Lynn W. Franklin, Saltillo, Coahuila, the actual cost of production of candellila wax in Mexico is 52½ centavos for each kilo, or approximately $0.1134 per pound. The State tax on the wax is two per cent of the actual value; the Federal tax is twenty-five per cent of the state tax, that is, if the value of the wax is 2,500 Mexican silver pesos, the State tax would be 50 pesos, and the Federal tax, twenty-five per cent of the 50 pesos or 12.5 pesos; making the total tax 62.5 pesos. The freight on the wax is 2.05 centavos per kilo delivered to the U. S. Border. The agent's commission amounts to one per cent, and there are sundry weighing and warehouse charges that amount to three fourths of one per cent. The actual value of candellila wax, f.o.b. car at Saltillo is 73½ centavos per kilo, equivalent to $0.21 (U. S. Currency) per pound c.i.f. New York.

A shipper of candellila wax from Coahuila to New York billed a shipment in 1928 as follows:

7,147 pounds of candellila wax @ 21 cents valued at $1,500.87 (U. S. Currency).	
Sacking, weighing, and hauling	$ 45.00
Freight to Tampico	75.00
Freight to New York	50.00
Customs Broker Charges Tampico	15.00
Mexican Government Tax	105.00
Consular Invoice	2.50
Total expenses included in above price of $1,500.87.	$292.50

Prices for candellila wax placed in New York in 1923 averaged slightly over 17c per pound; in 1926, the average was 23c per pound; in March, 1927, 30c per pound; and in January 1928, 21c per pound. Nominally the wax is worth 1.05 Mexican silver pesos per kilo, which is equivalent to $52.50 U. S. Currency per 220.46 pounds (1 kilo is equivalent to 2.2046 pounds).

With the crudest methods of production, and with yields of only from one to one and one-half per cent, the Mexican establishments are able to produce the wax for about eleven cents per pound; the average New York market price of candellila wax is approximately double the cost at the Mexican factory; in other words there is a spread of a further eleven cents to absorb profits, customs and consular charges, Mexican State and Federal taxes, and high freight costs to New York.

Whether extraction factories located in Southwest Texas for the recovery of candellila wax could produce the wax for eleven cents per pound is a matter for determination; it would seem that Texas establishments could at least equal the results obtained in Mexico, and for that matter, with equipment that would give a yield of as much as four per cent wax, and more efficient methods of weed collection and plant operation, they should surpass them. Assuming that they could not recover the wax at a lower cost of production than the Mexican plants, there should still be a sufficient difference between the cost and the market prices to show a good manufacturing profit.

J. Wrench, Sales Manager, Industrial Chemical Sales Company, Inc., of New York left on October 4, on a business trip enroute to the South and the Pacific Coast. His trip will include calls at the company's distributing centers and at the Chicago Office.

In a recent patent on deodorizing fats and oils by steam distillation, the inventor claims; "Steam is caused pneumatically to lift oil from a body to be treated and above the level of the surrounding liquid. The lifted oil and steam are brought into intimate contact in a described apparatus and the steam and gaseous products are then removed." U. S. Pat. No. 1,771,561.

Free fatty acids in animal or vegetable fats or oils are saponified under vacuum by solutions of alkaline compounds having a basic reaction at a temperature of 35-40°C.; the vacuum is increased during or after neutralization until the soap can be separated from the oil or fat by filtration. Fr. Pat. No. 683,468.

Experiments on the preservation of fats by the addition of small quantities of preservatives have shown that lard, for example, can be completely preserved by the use of any one of the following: resorcinol, 1%, oil of clove, 0.38%, guaiacol, 0.66%, thymol 2.5%, creosote 0.25%.—*Am. J. Pharm.* 102, 146-54 1930).

The Rapid Determination of Total Fat

Variation in Specific Gravity of a Solvent Made Basis of Analysis of Seeds or Press Cake for Oil Content†

By CLARENCE P. HARRIS*

Part II

IT SHOULD be remembered that all of the methods thus far enumerated involve the use of an analytical balance for weighing the sample, an operation which many plant foremen in factories which do not employ chemists would find troublesome. Most of these methods require the usual careful technique of the analytical chemist and are, in fact, designed for the use of such trained technicians. One of the objects of the methods developed by the writer was to provide a procedure which, while sufficiently quick and accurate to appeal to the analyst, would also prove simple enough to enable an individual of little technical training to perform most of the operations. First, it was necessary to discard the analytical balance. It seemed hopeless to expect men accustomed to handling tons of product to acquire the skill or desire to use that delicate instrument. Accordingly, it was decided to use a balance accurate only to one-tenth of a gram, and a sample of 100 grams, in order to permit weighing to one-tenth of one percent. The methods involve the solution of the fat with a definite weight of solvent, filtration of most of the solution from the insoluble residue, and the determination of the change in specific gravity of the solvent by means of special hydrometers which are accurate to 0.0001 specific gravity and are calibrated directly to percentage of fat present. In detail, for cocoa powder and chocolates in molten state the operation is as follows: A special aluminum beaker and stirring rod is placed on the *right* hand pan of the torsion balance as shown in Fig. I. A brass weight equal to the weight of the beaker and rod plus 100 gm. is placed on the left pan and the sample introduced into the beaker until the scale is in equilibrium. A dash pot is used on the newest balances which damps the vibration and brings the pointer to rest very quickly. After 100 gm. of sample, either cocoa powder or molten chocolate liquor or coating has been thus weighed out, about two inches of the beaker are filled with the solvent, and the mixture stirred until it is homogeneous. The beaker is now replaced on the right hand balance pan, the weight replaced by a larger one and the solvent run in from a glass siphon until the balance is again in equilibrium. The contents of the beaker are now thoroughly stirred and allowed to stand two to three minutes with occasional stirring. This procedure dissolves *all* of the cocoa butter present. A Büchner funnel is now prepared with a filter paper and wet with three cubic centimeters of solvent, measured in a small calibrated vial. Two tablespoonfuls of shredded asbestos are stirred into the beaker to assist filtration, the filter flask shown in Fig. II connected to a source of suction and the mixture filtered. The time of filtration will vary with the fineness of division of the cacao particles but should not exceed 8 to 10 min-

Fig. I

* Consulting Chemist, New York City.

† *The method described in this paper was invented and developed by the writer while associated with the Schwarz Laboratories, Inc., New York.*

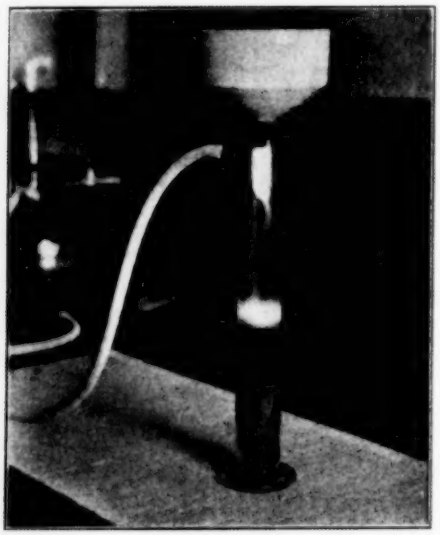

Fig. II

utes. The funnel is removed from the filtering cylinder, and one of the special hydrometers, similar to that shown in Fig. III, is inserted into the solution of cocoa butter in the solvent and the percentage of cocoa butter present in the sample is read directly, as shown in Fig. IV. These hydrometers are standardized at 20 deg. C. but the temperature correction scale visible in Fig. III makes accurate readings possible at any point between 17 and 23 degrees C. Only a very approximate temperature adjustment is therefore necessary. If the temperature is too low, the mercury will not appear on the lower scale, and the solution in the cylinder can easily be warmed by the heat of the hand to the proper range. If the temperature is too high, the solution is cooled by a special jar fitted with water inlet and outlet. In summer, if the room temperature is high it is advisable to stand the cylinder in the cooling jar during the filtration.

The solvent used is non-inflammable, very slightly volatile, has a gravity much greater than that of the fat, and is inexpensive. Solutions can be allowed to stand for twenty-four hours exposed to the air without alteration of reading.

Fig. IV

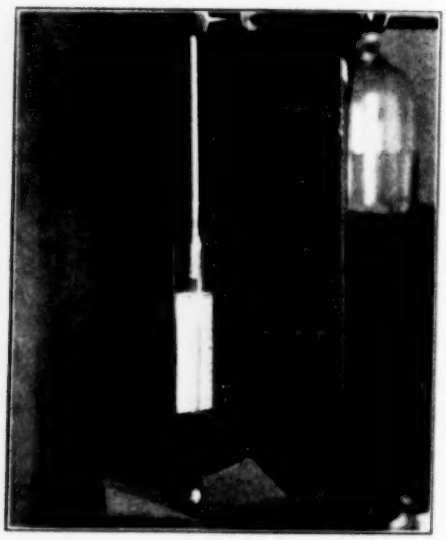

Fig. III

Cottonseed Meal Method

A METHOD developed for use on cottonseed meal is decidedly simpler. The sample must first be ground so that at least 80% will pass through a 60 mesh sieve. All of the solvent is then weighed at once instead of a portion being added first; wetting the filter paper with the small amount of liquid is unnecessary and is omitted. The entire operation, subsequent to the grinding, requires ten minutes. Similar technique is used for cacao nibs, shell, expeller cake etc. Various other methods are being developed for use with materials bearing other vegetable oils and fats.

A comparison of results obtained by this and other methods follows:

(*Turn to Page* 387)

Soybean Crushers Adopt Ethics Code

National Body of Millers Proposes to Conduct Business Along Lines of Sincerity and Service

THE National Soybean Oil Manufacturers Association has proposed for adoption by all its members one of the most comprehensive Codes of Ethics yet ventured upon by a Trade Association. If the members all adhere to the spirit as well as the letter of such a Code, the manufacture of soybean oil will quickly take a place of leadership among the country's businesses of highest conduct standards. The Code of Ethics in full is given as follows:

We, members of The National Soybean Oil Manufacturers' Association, mindful that we are engaged in a vocation affording us a distinct opportunity to serve society and to promote and maintain friendly and truthful relations among men, do pledge ourselves:

First: To strive by sincere, intelligent and lawful co-operation to use our best endeavors to elevate the standards of the vocation in which we are engaged and so to conduct our affairs that others in our vocation may find it wise, profitable and conducive to happiness to emulate our example.

Second: To employ workers of high character and dependability, and to provide conditions favorable to their welfare and moral development, and to pay for an honest day's labor an adequate wage consistent with standards of living and services rendered.

Third: To use only high grade materials and to seek by every possible means to know the true value of same in order that misrepresentation, unknowingly, may be avoided. To refrain from using inferior materials or imitation products in order to meet some unusual competitive conditions or for the purpose of returning a larger margin of profit.

Fourth: To observe truth and honesty in all interviews with salesmen and to make no false or misleading statements to secure price revision. To conscientiously comply with terms of payment according to terms of purchase and to refrain from making unjust and unreasonable claims in an attempt to evade liability under a purchase contract.

Fifth: To compete always with fairness, securing patronage on merit and confidence, rather than by derogatory reference to a competitor or his goods and to abstain at all times from making false or disparaging statements, either written or oral or circulating harmful rumors, regarding a competitor's products, financial or personal reputation.

Sixth: To refrain from infringing upon the equal rights of a competitor and unfairly interfering with his business by misappropriating his trade names, or formulae, or by enticing away his employes.

Seventh: To be guided by a spirit of justice, integrity and honor in all our relations with members of the allied trades, realizing that the standard of ethics in our own industry so vitally affects the standards maintained in associated industries. To encourage the allied trades to adopt similar codes and to discourage unfair trade practices in those industries even though such business methods are to our own immediate advantage.

Eighth: To conduct our business in such a manner that we may render a highly satisfactory and economical service to our customers. To know accurately our costs of management, production and distribution, in order that a fair price may be charged and a reasonable profit assured. To represent our products truthfully at all times in our advertising and our labeling and to adhere to specifications as carefully as is commercially possible. To strive to constantly improve the quality of our products and service and to build an established confidence in the hearts of our patrons.

Ninth: To conscientiously adhere to the rules of conduct herein set forth and to inspire others in our industry to do likewise, believing sincerely that the Golden Rule in business is the only safe guide of conduct conducive to continued satisfaction and happiness.

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Total Fat Determination

(*From Page* 384)

CHOCOLATE LIQUOR

Sample	New Method	A.O.A.C.*	Manufacturer's Analysis
1.	53.9 %	53.1 %	53.84%
2.	52.45%	52.25%	53.5 %
3.	53.3 %	53.3 %	—

* A.O.A.C.—Official Method of Association Official Agricultural Chemists.

CHOCOLATE LIQUOR (Cont.)

4.	52.6 %	52.64%	—
5.	53.2 %	—	53.22%
6.	52.7 %	—	52.72%
7.	54.2 %	54.23%	—
8.	55.9 %	55.3 %	—
9.	55.1 %	—	55.2 %
10.	53.6 %	—	53.6 %

COCOA POWDER

11.	26.4 %	26.6 %	—
12.	22.7 %	22.9 %	22.9 %
13.	22.9 %	22.87%	23.88%
14.	9.9 %	—	9.73%
15.	13.5 %	—	13.5 %
16.	22.4 %	—	22.04%
17.	20.5 %	—	20.2 %

SWEET CHOCOLATE COATING

18.	36.3 %	36.7 %	—
19.	36.4 %	36.21%	36.24%
20.	36.8 %	36.83%	—
21.	35.1 %	35.35%	—
22.	39.1 %	38.73%	—
23.	34.2 %	—	34.67%
24.	35.0 %	—	34.9 %
25.	35.5 %	—	35.8 %

MILK CHOCOLATE COATING

Note. Due to the difference in gravity between milk fat and cocoa butter a correction must be applied to the results on this material, usually 0.3%, but sometimes higher if a large amount of milk solids have been incorporated. This correction which is added to the result is determined by analysis of the product and remains constant for that particular grade of coating.

26.	35.3 %	35.5 %	—
27.	34.5 %	34.1 %	34.51%
28.	33.5 %	33.9 %	—
29.	35.3 %	35.53%	35.6 %
30.	34.8 %	34.93%	—
31.	41.6 %	41.69%	—
32.	33.6 %	—	33.68%
33.	33.3 %	33.24%	33.19%
34.	32.9 %	32.93%	—

EXPELLER CAKE

35.	11.5 %	11.43%	—
36.	11.5 %	11.33%	—
37.	9.5 %	9.69%	—
38.	11.4 %	11.26%	—

COTTONSEED MEAL

Sample	A.O.C.S.*	New Method
A	4.05%	4.1 %
D	8.2 %	8.1 %
C-12	6.25%	6.15%
C-16	6.02%	6.1 %
55	5.98%	5.9 %
C-13	6.21%	6.2 %
B	4.55%	4.4 %
50	6.0 %	6.0 %
51	5.76%	5.75%
C-14	6.25%	5.95%
C-15	6.17%	6.1 %

*A.O.C.S.—Official method of the American Oil Chemists Society.

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Cherry Kernel Oil

(*From Page* 372)

The saturated acids consist chiefly of palmitic and stearic acids, along with small quantities of arachidic and myristic acids, whereas the unsaturated fraction consists of oleic and linolic acids.

The refined oil, after being held for more than a year, was found to be in excellent condition, indicating that it has good keeping qualities. The results of the investigation made on cherry kernel oil indicate that it should prove useful as a high grade salad oil, and because of its similarity to almond oil it should be suitable for use in the manufacture of cosmetics.

Dr. Amando Clemente and Miss Adelaido Bendana, both of the Chemistry Department of the University of the Philippines, have announced the discovery of a new process for decolorizing coconut and cottonseed oils which is said to produce water-white oils.

The manufacturing plant of the Oil Products Company, producers and refiners of vegetable oils, at Singac, New Jersey, was completely destroyed by fire recently. Early estimates placed the loss at more than $50,000.

Present Oil Milling Conditions in Germany

After Having Touched Low Ebb, Industry Is Now Rapidly Recovering Through Improvement in Margarine Demand

By E. Talbot Smith*
U. S. Consul at Hamburg

THE business situation in the German oil milling industry is normally influenced by two factors; firstly, the total quantity of domestic oil cake and oil meal stocks on hand and, secondly, the relation between the fluctuating world market prices of oil seeds and oil fruits and the prices realized through the sales of crude and refined oils and fats. In regard to both factors, the German oil millers have recently passed through a crisis, but it seems that at present the industry has safely passed through the deepest depression.

Increase of Stocks on Hand

THE large existing rye stocks in Germany, the poor purchasing power of the German farmers this spring when an abundant green fodder crop seemed likely and the heavy drop in grain and butter prices, have all resulted in a tremendous increase of the stocks of linseed, peanut and palm kernel oil cake, copra, and soya meal on hand at the plants of the few large oil mills at Harburg, Stettin, Bremen and Mannheim. In fact, these stocks only very recently are said to have reached a total of 100,000 tons. When one considers that quite a few German oil mills are so large as to have an annual capacity for working oil seeds exceeding several hundred thousand tons, (Therl at Harburg even 650,000 tons, Brinkmann & Mergell, 300,000 tons, Noblee & Thorl 275,000 tons, the Stettiner Oelwerke 200,000 tons, Bremen-Besigheim 250,000 tons, Hansanuhle 120,000 tons, etc.), it is easy to understand that these mills, in their purchases of oil seeds, must look well to the future.

Since the beginning of this calendar year, prices of soya beans and other raw materials for the oil mills have decreased a third. The profitable operation of oil mills under such conditions is extremely difficult, particularly when one considers that last year Germany imported a total of about 2,600,000 tons of oil seeds, valued at over a billion Reichamarks. On a falling market, this amount of oil seed can only be profitably worked if there is a very rapid turnover and if credit conditions are favorable.

About one half of the manufacturing operations in the oil milling fields are controlled by the Dutch-English Jurgens Van der Bergh concern, the German mills of which are heavily engaged in crushing for the concern's margarine and soap plants abroad. However, in spite of all measures recently taken by this concern, that part of its oil cake output destined for the German market proved too large. Soya meal constitutes almost exactly one half of the total annual German output of oil cake and related products, totalling 1,700,000 tons, and the production of oil cake thus proved most disastrous to the independent oil millers, who have taken up soya bean extraction chiefly for the soya meal obtained. It may be mentioned in passing that soya beans contain only 15 to 16 per cent of the oil, as against 63 per cent in copra, and 42 per cent in peanuts. This oversupply of oil cake proved most unprofitable to the mills as during the first five months of 1929 Germany imported 1,130,136 tons of oil seeds which rose in 1930 to 1,137,695. The total value, however, decreased 30,000,000 Marks, which, however, was not as great as might have been expected, considering the decrease in other similar commodities. The price was kept up to an extent by favorable speculative transactions. Under the pressure of the poor market for oil cake and meal, many plants have during the last few months been partly shut down; hardly any mill worked at more than 70 per cent of its capacity and several large plants have been completely idle while at the end of last year the mills had still planned large extensions and the construction of new plants for hardening oil and so forth.

* Report to Department of Commerce dated August 18, 1930.

Bad Times Good for Margarine

IT IS characteristic of the German oil milling industry, however, that it takes a new impetus just in times of poor general conditions. The large unemployment prevailing at present in Germany has tended to increase margarine consumption, which is now approaching 500,000 tons per year. Over 50 per cent of the solid and semi-solid oils and fats made in Germany is used for making margarine. Many Germans of the poorer middle classes and the majority of the unemployed working classes have of late taken to margarine, and this growing consumption, coupled with the demand for oil cake caused by the protracted drought in Germany, has rendered the situation of the German oil millers much more favorable than it was a short time ago.

New Combinations

AN important fusion of interests in the German oil milling industry is rumored to take place soon. As is well known, the Dutch-English Jurgens-Van der Bergh concern controls approximately 50 per cent of the German oil milling industry. In December, 1929, the Harburg oil mill of Brinkmann & Mergell and three other independent margarine plants of the Hamburg district established an association of the independent German oil and margarine companies, called "Margoel," in order principally to make themselves independent of the raw material deliveries on the part of the Jurgens-Van den Bergh concern. This new association has in the meantime been joined by two large oil mills and twenty-four additional margarine plants, now having a total membership of thirty. The new combine has made special efforts to produce hardened oils which have heretofore been practically controlled by the Jurgens people. While the thirty members of the new combine have thus been materially benefitted by their fusion, the numerous smaller German oil mills, which belonged neither to the Margoel nor to the Dutch concern, felt that their market had been still more restricted. They have of necessity had to devote their works to the production of technical fats and oils, as the margarine making plants are now bound by the two combinations to buy their margarine oils. In order to extend and assure the existence of these independent German oil mills, of which a large number are located in the Hamburg district, ten large mills are now reported to be negotiating the establishment of a buying co-operative organization which may lead to further combination. Through concentrated purchases of raw material in the world markets, which has lately become somewhat difficult for Germany through the weakening of the financial power of the Hamburg oil seed brokers, it is expected that a noticeable saving in freights, banking charges and the like will be achieved. It is also expected that the present excessive competition of the mills will be lessened and that ultimately production will be regulated. It is also hoped that it will be possible to obtain large collective credit guaranties for the oil mills from the large German banks and that Germany, being by far the largest consumer of oil seeds in the world, will eventually become independent of the contracts and terms of the London and Rotterdam oil seed markets.

Color Reactions of Oils

By W. H. DICKHART

WHILE experimenting to prove the following text book quotation, "Vegetable Colors can be extracted from acid solutions by amyl alcohol[1]," these results were obtained when the test was applied to vegetable oils.

Reactions: Ten cc. of oil in a test tube was acidulated with 1 cc. of concentrated hydrochloric acid and to this mixture was added 10 cc. of amyl alcohol. The test tube was shaken for a minute or two and then allowed to stand until the amyl alcohol separated. Olive, cottonseed,[2] sunflower, peanut, rapeseed and tung oils showed no color to the amyl alcohol solution, while soy, linseed and perilla oils gave a blue color to the alcohol. After allowing all these oil solutions to remain over night, the linseed oil sample in amyl alcohol solution had turned a yellow and the rapeseed was the same as the linseed oil. The perilla oil solution had become a pale blue while the deep blue of the soy oil solution did not change. All the other samples were colorless.

A mixture of 10% soy and 90% tung oils was made up and tested. At the same time a blank was tested using tung oil. The blue color was produced by the mixed oil sample while there was no color with the blank.

These color reactions might be of some importance to those manufacturers who process any of these oils which produce the color, in the same equipment used for processing oils that do not give the color reaction.

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[1] *"Quantitative Analysis"* by Frank X. Moerk, P. 119.

[2] Crude cottonseed and palm oils give red colors.

ABSTRACTS

David Wesson, *Abstract Editor*

Further papers of interest in the Chemistry of Fats and Oils, which were presented at the meeting of the American Chemical Society, Cincinnati, September 8-12 are given in abstract as follows:

1. *A Comparison Of The Highly Unsaturated Acids Of Beef, Hog, And Sheep Brains.* J. B. Brown and W. C. Ault. Fresh beef, hog, and sheep brains were hydrolyzed by boiling 20 per cent sodium hydroxide, and the soaps extracted quantitatively from the solution by butyl alcohol. The fatty acids were recovered and brominated in cold ether. The polybromides were recovered and thoroughly washed. They were reduced by boiling with zinc dust in methyl alcohol. The methyl esters were distilled and analyzed. The yields of polybromides were essentially the same from the different lots of brains studied, showing a constant content of highly unsaturated acids. Analysis of the methyl esters from beef and sheep brains showed a decided similarity. One preparation (sheep) had an iodine number of 349. The molecular weight of the acids as well as the iodine number supported the probability of the presence of tetracosapentenoic acid, $C_{24}H_{38}O_{21}$, in beef and sheep brains. The acids obtained from hog brains gave analytical data very close to the theoretical for arachidonic acid, but the methyl ester polybromide did not melt.

2. *The Nature Of The Highly Unsaturated Fatty Acids Stored In The Lard From Pigs Fed On Menhaden Oil.* J. B. Brown. Two pigs, without previous starvation, were fed over a period of five weeks on an adequate diet containing approximately 14 per cent of refined menhaden oil. Two control pigs received the same diet without the oil. At the end of the feeding experiment the animals were killed and the livers, brains, and specimens of leaf and back fat were removed for analysis. The lipids and fatty acids of the livers of the oil-fed pigs showed greatly increased iodine numbers over those from the control animals; likewise the analytical data on the back and leaf fat indicated storage of the fish oil acids, although the effect was not as great as would have been obtained with previous starvation. The brains of the four animals contained practically the same amount of unsaturated acids. From the lard of the oil-fed pigs, the highly unsaturated acids were isolated and compared with those obtained from the menhaden oil in the same manner. The deposited acids were of about the same molecular weight, but were considerably less saturated than those from the fish oil. About 2.7 per cent of highly unsaturated acids was stored in the body fat under the conditions of this experiment.

3. *The Changes In The Total Fatty Acids, Phospholipid Fatty Acids, And Cholesterol During The Reproductive Cycle.* L. A. Maynard and E. S. Harrison. The total fatty acids, phospholipid fatty acids, and cholesterol have been determined periodically in the blood of milking cows throughout their reproductive cycle. During the dry period the values for all these constituents are low and fairly constant. After parturition there is a gradual rise in these blood lipids to maxima which are from 50 per cent to 100 per cent or more above the levels of the dry period. The values remain high for several months, gradually dropping to their original levels as lactation declines and ceases. Throughout the entire reproductive cycle the curves of the three constituents studied tend to parallel each other, showing a close metabolic relationship among them.

An exhaustive analysis of Japanese great herring oil, carried out on the original oil, on its mixed fatty acids, and on the separated solid fatty acids caused the authors of the work to arrive at the conclusion that the saturated fatty acids (15 percent of the mixed fatty acids) consisted chiefly of palmitic acid, some stearic and myristic acids and small quantities of arachidic and behenic acids. They also detected small quantities of a water-soluble fatty acid resembling butyric or valeric acid. *J. Soc. Chem Ind. Japan,* Suppl. Bind, 33, 62B, (1930).

For the removal of free fatty acids from lard, the lard may be treated with an excess of sodium bicarbonate in the presence of a limited quantity of water, with agitation, at a temperature of about 60-95°C. U. S. Pat. No. 1,767,999.

Notes of the Industry

Salad Dressings in Louisville

Salad dressings were generally profitable to the 25 retail grocers carrying them whose operations were intensively analyzed by the Bureau of Foreign and Domestic Commerce, in connection with its Louisville Grocery Survey. Only 3 stores out of the 25 failed to make a profit on salad dressings, the average net profit being 9.4 per cent of sales. Net profit in the sense used here refers to pure earnings over and above all expenses, including proprietor's salary, rent, and 6 per cent on investment, whether or not these items of expense are actually paid out in cash. Salad dressings represented 0.5 per cent of total sales, and about 1.7 per cent of sales exclusive of perishables. The average gross margin for salad dressings was 26 per cent as against 26.4 per cent for all commodities, but in operating expenses salad dressings showed an advantage of 1.5 per cent below the average cost for all commodities. Salad dressings show an average of one more stock turn a year than other groceries except perishables, 8.5 times against 7.5 times, the average turn for perishables being 76.4 times annually. A wide range was noted in the number of turns of salad dressings per store. The store with the highest turn, 21.1, showed a net profit of 15 per cent on this item. The three stores reporting a net loss on salad dressings turned their stock of this commodity 6.1, 6.1, and 3.5 times, respectively, but the store which stood second lowest, with but 5 turns per year, showed a net profit of 8.4 per cent. Copies of Selling Salad Dressings through Retail Stores, like the earlier similar reports on coffees and cereals, are available without charge from any District Office of the Bureau of Foreign and Domestic Commerce.

New Procter Plant

The new plant of the Procter & Gamble Company, at Long Beach, California, on which work is progressing rapidly, will occupy a 15-acre site on West Seventh Street in the Harbor District, immediately adjoining the site of the Pacific Southwest Exposition of 1928. The plant will comprise complete units for the manufacture of the company's well-known brands of edible products and soaps.

Study Vegetable Oil Tariff

Vegetable oil production costs will be studied by the United States Tariff Commission in compliance with recent Senate resolutions. A resolution sponsored by Senator Morris Sheppard of Texas directs the commission to submit to congress a detailed study of the costs of production and transportation to principal consuming markets in the United States of coconut oil and copra from the Philippine Islands, and from other principal producing regions and also palm, palm-kernel, whale, rapeseed, perilla and sesame oils. The principal uses of these oils in the United States and of the kinds and amounts of domestic oils and fats replaced in domestic industry by these imports is to be stated. As these oils are not produced in the United States, the commission could not make such an investigation under the flexible provision of the tariff act, and this investigation will be conducted under its general investigating powers. The report will not be the basis for duty changes except by congress.

Archer-Daniels Enters Food Field

The Commander-Larabee Corporation, third largest milling company in the United States, has passed to the control of interests, associated with the Archer-Daniels-Midland Company and Guy A. Thomas, Minneapolis. This control has been acquired through the purchase of the Continental Baking Company's holdings in the milling company. Mr. Thomas will become chairman of the board of the Commander-Larabee Corporation and S. M. Archer of the Archer-Daniels-Midland Company will be made president. The milling company will be operated under the management of the newly organized National Foods Corporation, a Delaware concern, of which Messrs. Thomas and Archer are directors in addition to Samuel Mairs, L. M. Leffingwell of the Archer-Daniels-Midland Company, C. T. Jaffray, president of the Soo Line, and A. M. Washburn of the First National Bank of Minneapolis.

Indian Peanut and Linseed Crops

The final forecast for the whole of India estimates a yield this year of 2,475,000 tons of unshelled peanuts and 374,000 tons of linseed as against 2,248,000 tons and 322,000 tons respectively in 1929.

Java Trade in June Quarter

The exports of copra, copra cake and coconut oil for the June quarter of 1930 from Java and Madura are as follows:—

	Copra and Copra Cake Metric tons	Coconut Oil Metric tons
Holland	4,801	2,330
Germany	3,102	192
Great Britain	995	770
Belgium	3,547	—
United States	—	898
Other countries	1,622	—
Totals	14,067	4,190

Following are tables showing exports of copra, copra cake and coconut oil for the June quarter 1930, as reported separately from the Javanese ports of Batavia (Tandjong Priok), Surbaya and Tjilatap:—

	Copra and Copra Cake Metric tons	Coconut Oil Metric tons
Batavia	3,159	—
Surabaya	4,806	2,722
Tjilatap	3,557	1,980
Semarang	88	—
Totals	11,610	4,702

The arrival on the market of coconuts is comparatively scant. The nuts on the trees are being somewhat neglected by the natives since they cannot secure good prices for them in the markets. The present crop and the outlook for harvests in the near future are poor. Early and continued droughts are partly responsible. During the June quarter of 1930, prices for copra in lots of 220 pounds ranged for export from $6.67 to $8.44; prices for home consumption. $8.44 to $8.84.

Coconut oil prices during the same period, per 220 pounds, for export, ranged from $12.06 to $13.87 and for home consumption, from $13.87 to $14.67. Owing to the lesser price obtainable in exporting, the leading local exporter states that only existing export contracts are being sold at higher prices for local consumption.—*Report from Vice Consul Lanctot at Surabaya.*

The following table shows the exports of certain oleaginous products from China to the United States during the seven months of 1930 ending July:

Bean cake meal	$793,000
Sesame seed	936,000
Wood oil	8,742,000
Vegetable tallow	553,000
Peanut oil	2,341,000
Soya bean oil	515,000

American Whaling Revival

For the first time in several decades a whaling vessel bearing the American flag will be seen in the whaling waters of the Antarctic Ocean this season when the steamship Frango of the newly-organized American Whaling Company, New York, arrives. The Frango is a 6,000 ton oil-burning vessel, equipped with every modern device for whaling and is regarded as a pioneer in the renaissance of American whaling.

Herring Oil from Iceland

Considerable economic importance is attached to a new herring oil factory which is ready for operation at Siglufjord, Iceland, and which the government will presently open. The plant will be the largest in the country, is located in the heart of the herring fishing industry, and will be operated by a co-operative association, although government owned. It will be fully able to handle the large herring catch of the country. Heretofore it has been necessary to throw away thousands of hectoliters of herring because of the limited factory capacity.

Argentine Linseed Crop

The Ministry of Agriculture of Argentina has estimated the acreage sown to linseed during 1930 to be 7,536,550 acres as compared with the forecast of 7,089,299 acres for 1929 issued on October 8th of last year. Early growth is said to be proceeding under good conditions. In the province of Santa Fe some fields were adversely affected by frosts, but this was not of importance. Further rain will favor those late-sown fields where the plant has not yet sprouted and the growth of others where there has not been progress recently.

Freight rates on palm oil from Straits Settlement ports to Conference basis ports in Europe have been reduced to $14.29 per scale ton, in cases and the freight on palm kernels has been reduced to $7.20 per scale ton for the same journeys.

The feeding value of soybean meal will be the subject of a pamphlet being prepared for general distribution by the National Soybean Oil Manufacturers' Association.

Harry E. Smith has resigned his position with Devoe & Raynolds to take a position in the research laboratory of Foster Dee Snell, Consulting Chemist.

OIL & FAT INDUSTRIES

The Editor's Page

Nationalism—or Progress?

IN THIS issue we publish the first instalment of a report from Frank Messenger, U. S. Foreign Trade Commissioner at London, covering the summaries presented by the representatives at the International Convention of Oil Seed Crushers of every important oil-producing country with the exception of the United States.

The countries represented at this conference included Great Britain, Germany, France, Italy, Belgium, Norway, Sweden, Denmark, Japan, Manchuria, and others. Each nation presented a summary of conditions affecting oilseed purchases, production and sales of oil and cake and competitive conditions within its oil industry.

That the United States was not represented at this conference except by Government observers, seems to us a very significant fact. Have our tariff barriers and other evidences of extreme nationalism as applied to the oil milling industry caused us to overlook entirely the fact that all trade in vegetable oils and oilseeds is affected most appreciably by influences which are international in their scope and bearing?

The oil crushers of Europe have organized in various ways to protect their raw material sources and their markets. The many great mergers of soap and margarine manufacturers and oil millers in recent years have known no national boundaries. The Association of Seed Crushers, likewise, has opened its membership to all comers, excepting possibly Americans. That our interests are closely interwoven with those of the seed crushers in other countries is best exemplified by the growing imports of copra, coconut oil, palm and palm kernel oil and other tropical produce into the United States. Our cottonseed oil, it is true, is largely consumed at home, but the markets for this commodity must inevitably feel the effect of worldwide conditions in oil trade in general.

We feel sure that the European crushers would welcome American membership in their international association. The National Cottonseed Producers Association could serve its members well by active participation through the attendance of accredited representatives at the Annual Conference of this International Association.

Subtle Sabotage

IN THE dictionaries, "sabotage" is defined as "the willful injury of materials or machinery by workmen", but in recent years there has arisen a form of industrial hindrance which, while not covered by the definition as written, can be classified truly as sabotage quite as much as wrecking of machinery and deliberate spoilage of material.

We refer to the deliberate institution of fake or far-fetched damage suits for personal injuries said to be attributable to some obscure defect in operating or sanitary conditions in a manufacturing plant. The business of faking accidents and personal injuries as the basis for damage suits against public utility corporations has been so thoroughly exposed that it no longer offers a lucrative field for the questionable activities of contortionists, shyster lawyers and doctors of the same ilk, as well as the double-jointed and the asthmatic.

It may be, then, only natural that certain of these artists should turn their attention to the industrial field, wherever opportunity presents itself. The general dissemination of knowledge concerning the steps taken by some industrialists to promote employee welfare may easily have served to show the backdoor barristers a new stage upon which to "strut their stuff." With all our progress in sanitation and in the control of occupational diseases, there still remain situations in industry where these harpies can gain a foothold and cause untold damage to the reputation and to the credit of otherwise sound businesses.

Elsewhere in this issue we report what is believed by the attacked manufacturer to be such an attempt upon a legitimate enterprise. That one hundred and fifty workers, or neigh-

bors, of a manufacturing plant could acquire asthma from a cake-grinding mill, particularly from a mill equipped with a dust-collector, may be possible, but to us, admitting our limited knowledge of the pathology and etiology of asthma, it seems most unlikely. There have undoubtedly been a few legitimate cases of innocently contracted occupational diseases in this country within recent years, but there have been, doubtless, many more instances of simulated disability, aimed at the bank account of the employer-victim.

Surely the liability underwriters and the country's manufacturers in general should take early measures toward cooperation to prevent this resurrection in the industrial field of that old public utility bugaboo, faked damage suits.

New Books

THE CHEMICAL ENGINEERING CATALOG: Fifteenth Annual Edition, The Chemical Catalog Co., Inc., New York.

The latest issue of our old friend, The Chemical Engineering Catalog, is now off the press, and, as in each year of its publication, is bigger and better than ever. This volume, containing the announcements of manufacturers of chemical process equipment, should be on the desk of every Chemical Engineer, Factory Manager, Operating Executive and Purchasing Agent of the chemical and process manufacturing industries. The Catalog is mailed by the publishers free of charge, with the understanding that it will be returned upon publication of the succeeding edition; or for three dollars, if desired to be permanently retained by the recipient.

Those eligible to receive the catalog upon these terms upon request are Chemical Engineers, Works Managers, Consulting and Designing Engineers, Chief Chemists, Heads of Chemical Engineering Departments in Universities, Colleges and Technical Schools, Technical Departments of Governments, and Libraries.

To those included in these classifications outside the United States and Canada, the Catalog is sent upon payment of three dollars plus postage. To all others the price of the book is ten dollars.

A particularly valuable section of the catalog is the technical and scientific books division, containing the announcements of publishers of technical and scientific works and an extended index of such books.

Shortening and Oil Prices

Prices of shortening and salad and cooking oils on Thursday, Oct. 23, 1930, based on sales made by member companies of the Shortening and Oil Division of the National Cottonseed Products Association, were as follows:

Shortening

	Per lb.
North and Northeast:	
Carlots, 26,000 lbs.	@10¼
3,500 lbs. and up	@10½
Less than 3,500 lbs.	@10¾
Southeast:	
3,500 lbs.	@10¼
Less than 3,500 lbs.	@10¼
Southwest:	
Carlots, 26,000 lbs.	@10¼
10,000 lbs. and up	@10¼
Less than 10,000 lbs.	@10¾
Pacific Coast:	@11

Salad Oil

North and Northeast:	
Carlots, 26,000 lbs.	@10
5bbls. and up	@10¼
1 to 4 bbls.	@10¾
South:	
Carlots, 26,000 lbs.	@10
Less than carlots	@10¾
Pacific Coast:	@10

Cooking Oil—White

⅛c per lb. less than salad oil.

Cooking Oil—Yellow

¼c per lb. less than salad oil.

Procter & Gamble Co. through their National Glycerine Service have sent out a short history of glycerine,—"The Sweet Principle of Oils,"—from the time of its discovery by Scheele in 1799, outlining its uses and its place in modern life and industry. It is termed "the chameleon of chemicals."

Silica Products Co., Kansas City, recently issued a 24-page bulletin on Bentonite, in which its properties, sources, geology and production are discussed. Numerous tables are included in the booklet which is also profusely illustrated.

Fall Meeting of Oil Chemists

Splendid Program Prepared for Scientific Discussions to Be Held at Chicago, November 13th and 14th

THE complete program for the 1930 Fall Meeting of The American Oil Chemists' Society, which is to be held at the Congress Hotel, Chicago, Illinois, on November 13th and 14th, presents an imposing list of original papers and Committee Reports, which guarantees that those who attend will receive valuable information bearing on the progress of oil chemistry.

President W. H. Irwin, of the Society, with the cooperation of the Chicago Committee on Arrangements, has provided instructive meetings and entertainment features which will make every minute of the members' and visitors' stay in Chicago most enjoyable. Registration for the meeting will be between 9:30 and 10:00 o'clock on Thursday, November 13th, at the Congress Hotel.

Dr. W. Lee Lewis, Technical Director of the American Institute of Meat Packers, will be the Guest Speaker at the Informal Noonday Luncheon of the Society on Thursday, November 13th.

Inspection trips through a number of the Chicago District's largest industrial plants, including the large Meat Packers' Plants at Union Stock Yards, The Corn Products Refining Company, Argo, Illinois Steel Company, Standard Oil Company of Indiana, Whiting, and other petroleum plants, The Chicago Municipal Sewage Disposal Plants, and others, have been arranged by the Local Committee on Arrangements. Visits to the Aquarium, the Planetarium and the Field Museum have also been arranged for.

J. J. Vollertsen, Chairman of the Local Committee, has also arranged to reserve seats at the two important football games on Saturday, November 15th, for those desiring to attend. The games will be Chicago vs Illinois at Chicago and Northwestern vs Wisconsin at Evanston.

Entries for the Team Bowling Competition have been so numerous that J. P. Harris, Chairman of the Bowling Committee, has found it necessary to reserve additional alleys at the Stevens Hotel, where the Tournament will be held.

The Program for each day's meeting will be completed at a single session, in order that visiting Chemists may arrange their trips to the particular plants of interest to them for the afternoons of the meeting days.

The complete Program of Committee Reports and Papers follows:

FIRST DAY: NOVEMBER 13, 1930

Archibald Campbell, Vice-President and Chairman of Soap Section, *Presiding*

Committee Reports:

Detergents Committee—J. G. Vail, Philadelphia Quartz Co., Philadelphia, Pa.

Glycerin Analysis Committee—J. T. R. Andrews, Procter & Gamble Company, Ivorydale, Ohio.

Soap Analyses Committee—H. P. Trevithick, Chief Chemist, New York Produce Exchange, New York, N. Y.

Papers:

"The Determination of Water in Glycerols"—L. F. Hoyt, Research Department of Larkin & Company.

"Lecithin, Its Effect Upon Hydrolysis of Fats"—R. B. Trusler, Davies-Young Soap Co., Dayton, Ohio.

"The Determination of Total Fatty Acids in Soap Using a Modified Stokes Flask"—A. K. Church, Lever Bros., Cambridge, Mass.

"Some Impressions of the European Soap Industry"—A. Campbell, Chairman of the Soap Section, Cincinnati.

"Fuller's Earth"—J. G. Withrow, Ohio State University.

"Technique of Bleaching Oils & Fats in the Laboratory"—J. T. R. Andrews, Procter & Gamble Co., Ivorydale.

"Soya Bean and Linseed Oil"—Otto Eisenschiml, President, National Soya Bean Ass'n, Chicago.

SECOND DAY: NOVEMBER 14, 1930

W. H. Irwin, President, *Presiding*

"Recent Technical Developments in the Margarine Industry"—B. R. Harris, Epstein, Reynolds & Harris, Chicago.

"Function of Shortening in Baking"—H. S. Mitchel, Research Laboratory, Swift & Company, Chicago.

"Corn Oil—Its Preparation and Usefulness"—G. A. Moore, Corn Products Refining Co., Argo, Illinois.

"Certain Basic Considerations in the Solvent Extraction of Vegetable Oils"—C. F. Eddy, Prosco Oils Corporation, Norfolk, Va.

"Antioxidants"—F. C. Vibrans, American Institute of Meat Packers—Research Department, Chicago.

"A Review of the Methods of Testing Rancidity and Stability in Shortening"—W. O. Pool, Research Laboratory, Armour & Company, Chicago.

"The Measurement of Consistency in Hydrogenated Shortening"—A. D. Barbour, Ontario Research Foundation, Toronto.

"New Method of Determining the Keeping Quality of Shortening by Measuring the Volatile Oxidation Products"—D. P. Grettie, Research Laboratory, Swift & Company, Chicago.

Soap Section Committees

ARCHIBALD CAMPBELL, Vice President of the American Oil Chemists' Society and Chairman of the Soap Section, announces the completed personnel of the Soap Section Committees of the Society as follows:

Glycerin Analysis Committee

CHAS. J. GUNDEL, *Fels & Co., Philadelphia;* C. A. Woodbury, *E. I. duPont de Nemours & Co., Wilmington;* Ralph W. Bailey, *Stillwell & Gladding, New York;* L. F. Hoyt, *Larkin Co., Buffalo;* A. K. Church, *Lever Bros. Co., Cambridge;* James W. Laurie, *A. O. Smith Corp., Milwaukee;* V. K. Cassady, *Palmolive Co., Milwaukee;* W. J. Reese, *Colgate-Palmolive-Peet Co., Kansas City;* Wm. A. Peterson, *Kirkman & Son, Brooklyn;* M. L. Sheely, *Armour & Co., Chicago;* John Ornfelt, *LaFrance Mfg. Co., Philadelphia;* H. C. Bennett, *Los Angeles Soap Co., Los Angeles;* W. H. Burkhart, *Gold Dust Corporation, Baltimore;* R. B. Trusler, *Davies-Young Soap Co., Dayton;* J. T. R. Andrews, *Procter & Gamble Co., Cincinnati,* CHAIRMAN.

Soap Analysis Committee

W. D. RICHARDSON, *Swift & Co., Chicago;* C. P. Long, *Procter & Gamble Co., Cincinnati;* A. K. Church, *Lever Bros. Co., Cambridge;* M. L. Sheely, *Armour & Co., Chicago;* Wm. A. Peterson, *Kirkman & Son, Brooklyn;* W. H. Burkhart, *Gold Dust Corporation, Baltimore;* M. H. Ittner, *Colgate-Palmolive-Peet Co., Jersey City;* R. B. Trusler, *Davies-Young Soap Co., Dayton;* H. P. Trevithick, *New York Produce Exchange, New York,* CHAIRMAN.

Detergents Committee

L. T. HOWELLS, *Cowles Detergent Co., Cleveland;* W. D. Appel, *Bureau of Standards, Los Angeles;* W.H. Burkhart, *Gold Dust Corporation, Baltimore;* A. K. Church, *Lever Bros. Co., Cambridge;* L. F. Hoyt, *Larkin Co., Buffalo;* E. B. Millard, *Mass. Institute of Technology, Cambridge;* H. S. Mitchell, *Swift & Co., Chicago;* C. J. Post, *National Oil Products Co., Harrison;* W. C. Preston, *Procter & Gamble Co., Ivorydale;* F. H. Rhodes, *Cornell University, Ithaca;* M. L. Sheely, *Armour & Co., Chicago;* F. W. Smither, *Bureau of Standards, Washington;* Foster D. Snell, *Brooklyn;* P. H. Walker, *Bureau of Standards, Washington;* W. R. Stryker, *Southport Mills, Ltd., New Orleans;* James G. Vail, *Philadelphia Quartz Co., Philadelphia,* CHAIRMAN.

Oil Chemists' Bowling Contest

Such extraordinary interest has been shown in the Bowling Contest at the Chicago meeting, that it had to be extended to two nights, November 13th and 14th in order to accommodate all entries.

Five man teams are now entered as follows: The Swift Vreems, The Wilson Certifieds, The Armour Stars, The Procter & Gamble Criscoes, The Swift Premiums, The American Maize Amaizoes, The Daiggers, The Industrial Nuchars, The Schaars, The Swift Jewels.

Mayonnaise Products Fifth Annual Convention

Enthusiastic Meeting of Progressive Manufacturing Group Held at Haddon Hall, Atlantic City

THE Fifth Annual Convention of the Mayonnaise Products Manufacturers Association of America, Incorporated, was held at Haddon Hall, Atlantic City, October 27th and 28th, under the management of Frank Honicker, Executive Secretary of the Association. The Convention was attended by representatives of the leading manufacturers of mayonnaise and allied products of the country and by many associate members, representing the mayonnaise machinery and supply industries.

All sessions of the Convention were held in the Benjamin West Room of Haddon Hall and much appreciation was expressed by those attending of the splendid program of papers and discussions arranged by Secretary Honicker and President C. P. McCormick. The complete program follows:

All sessions will be held in the beautiful Benjamin West Room, 13th floor, Haddon Hall, and on the same floor will be located Committee rooms, executive offices, registration bureau, etc.

Monday, October 27th

8:30-10:00 Registration. 10:00 Call to order by President C. P. McCormick (Vice President, McCormick & Company). Singing —"America." Welcoming Address: Mayor Bacharach of Atlantic City. Response: President's Annual Message: C. P. McCormick. Report of Secretary: Anna Schlorer Smith (Mrs. Schlorer's, Inc.) Report of Executive Manager: Frank Honicker. 11:15 Appointment of Nominating Committee and announcement of time and place of the election. Committee Reports: Publicity, Ellis R. Meaker, Chairman, (Ivanhoe Foods, Inc.) Advertising, E. J. Bannvart, Chairman, (Cecil, Warwick & Cecil). Membership, John T. Ogden, Chairman, ("The Glass Packer"). Address: "The Way Out of Our Business Depression," by James M. Matthews of Babson's. 2:00 Address: "Selling Mayonnaise Through Retail Stores," by Wroe Alderson, Chief Business Specialist of the Merchandising Research Division of the Department of Commerce. Address: "A New Outlet for Mayonnaise," by H. Paul Warwick of Cecil, Warwick and Cecil. Address: "The Food and Drugs Act and the Food Manufacturer," by P. B. Dunbar, Assistant Chief of Food and Drug Administration of United States Department of Agriculture. Address: "Where Are We Going"—Production Figures of Mayonnaise Products for the Year 1929, by R. S. Hollingshead, Assistant Chief of Food and Drug Administration of U. S. Department of Agriculture. Report of Standards and Research Committee, Dan M. Gray, Chairman, (Hazel-Atlas Glass Company). 4:15 Report of Nominating Committee.

Tuesday, October 28th

Wade E. Utley, Vice-President, Presiding.

10:00 Address: "Snapshots," by L. J. Schumaker, Vice-President of The Wagon Men's Distributing Association. Address: "An Outsider Looks at the Mayonnaise Industry," by R. W. McFadden, Managing Editor of "The Auto Truck Food Distributor." Address: "Some Interesting Considerations Regarding Rancidity in Mayonnaise,"—a paper by Albert K. Epstein and Benjamin R. Harris (Epstein, Reynolds and Harris). Address: "Reminiscences," by Dr. David Wesson. Address: by Dr. J. M. Widmer (Penick and Ford Sales Company, Inc.) Committee Reports: Transportation, R. J. Miedel, Chairman, (Hazel-Atlas Glass Co.) The report will be submitted by V. L. Garbesi (Hazel-Atlas Glass Co.) Glass Container, H. S. Wade, Chairman, (Owens-Illinois Glass Co.) Legislative, B. S. Pearsall, Chairman, (B. S. Pearsall Butter Co.) Address: "Giving Away Profit," by Laurence V. Burton, Associate Editor of "Food Industries." 12:10 Annual Election of Directors.

2:00 Closed Session for Active Members. Chairman — Anna Schlorer Smith (Mrs. Schlorer's, Inc.) Vice-Chairman — Wm. R. McKeldin (Atmore & Son, Inc.) Theme: "Pulling Together." An informal meeting open to active members.

Vegetable Oils Increase in Foreign Trade Volume

1929 Exceeds All Previous Years in Value and in Preponderance of Imports

By E. L. THOMAS*

PART II

WHEN it is realized that close to 30% of the value of all vegetable oil imports is represented by coconut oil exclusively from the Philippine Islands, it is seen at once how prominent a place the Islands assume as suppliers and conversely what a great advantage accrues to Island producers of copra to have the United States as a market for one of their principal export commodities. The record importation last year outstripped the previous year approximately 42% and likewise 1927 in very nearly the same proportions.

Palm Oil

AS A rule edible olive oil enjoys the distinction of second place in our vegetable oil import trade but last year gave way to palm oil which latter imports had a monetary value $1,000,000 greater than edible olive oil. Imports increased 54% in volume in 1929 as contrasted with 1928. Every producing area contributed to this gain, British West Africa leading with 74% greater tonnage last year than 1928, followed closely by the Dutch East Indies which registered 65% heavier volume of exports to the United States. United Kingdom and Belgian Congo were not far apart with respective increase of 35% and 37%.

Edible Olive Oil

THIRD in order of importance last year were our imports of edible olive oil, the volume being 17% larger than 1928. Greece, Algeria and Tunis, always of minor importance, profited through purchases by United States consumers of nearly twice as much more oil from these three countries last year as compared with 1928. We expanded our buying volume of Italian olive oil nearly 34% presumably because the price levels for Italian oils were more favorable than was the case with Spain which suffered almost a like diminution (28%) in its export trade with the United States last year. Imports of French oils were up 13%.

China Wood Oil

TEN per cent more of this oil came into the United States in 1928 than the preceding year. The increased imports were largely oil received by direct shipment from China as our imports from Japan fell off markedly and shipments from Hong Kong were also less.

Palm Kernel Oil

GERMANY and the United Kingdom continued to furnish our entire supply of this oil save for a very modest quantity from other sources. A gain of approximately 30% was registered in these imports last year and essentially the same ratio maintained between the two countries mentioned.

Imports of Sulphur Olive Oil and Foots oil were greater by one-sixth last year than the quantity entering the country in 1928. Italy was favored with 140% more business chiefly at the expense of Spain which suffered almost complete elimination as a supplier. This is a shift that is of frequent occurrence, however, and has no other significance than that more favorable quotations stimulated the movement of oil from one country to the temporary disadvantage of the other.

Sesame Oil

MORE interest displayed by manufacturers of cooking fats in particular is responsible in the main for the fact that imports of this oil were nearly treble those for 1928. Imports from the United Kingdom rose spectacularly from less than 20,000 lbs. in 1928 to nearly 10 millions of pounds last year. More commonplace by comparison were gains of 120% in our purchases from the Netherlands and about 50% in the case of oil of Danish origin. Imports from Belgium declined 70%.

TABLE II.

IMPORTS OF VEGETABLE OILS INTO THE UNITED STATES, 1928-1929

	1928		1929	
	Pounds	Value	Pounds	Value
Olive oil, edible, total	82,943,820	$14,951,146	96,798,254	$16,407,718
France	4,543,399	904,745	5,138,453	919,690
Italy	53,936,151	9,945,803	71,842,002	12,396,636
Spain	22,692,760	3,797,555	16,511,910	2,585,149
Greece	477,164	81,038	1,173,937	175,727
Algiers and Tunis	683,761	109,145	1,831,704	274,872
Other countries	610,585	112,850	300,248	55,644
China wood oil, total	109,221,771	$13,419,029	119,677,718	$14,972,084
China	97,783,436	12,033,364	109,549,217	13,732,755
Japan	650,212	84,234	35,665	4,803
Hong Kong	10,675,043	1,288,293	9,976,409	1,222,859
Other countries	113,080	13,138	116,427	11,667
Sesame oil, total	6,238,878	$664,764	21,587,615	$1,915,256
Denmark	1,091,263	118,630	1,534,845	158,674
Netherlands	4,455,007	461,434	9,704,650	893,398
United Kingdom	19,959	2,220	9,993,723	819,127
Belgium	267,707	30,366	77,807	8,484
Other countries	404,942	52,114	276,590	35,573
Peanut oil, total	4,748,818	$519,522	3,230,693	$333,201
France	553,102	63,651	176,294	19,970
Germany	1,302,766	116,616	1,278,740	104,217
Netherlands	111,613	12,880	173,939	19,221
China	1,492,316	144,694	144,531	16,361
Hong Kong	1,274,769	179,582	1,429,621	170,677
Other countries	14,252	2,099	27,568	2,755
Coconut oil, total	290,636,702	$23,061,357	411,936,213	$29,552,206
Philippine Islands	290,636,702	23,061,357	411,936,213	29,552,206
	Gallons	Value	Gallons	Value
Rapeseed oil, total	2,290,182	$1,504,338	2,506,834	$1,587,708
United Kingdom	1,305,331	880,064	829,250	561,836
Japan	887,881	582,111	1,635,666	996,615
Other countries	56,970	42,163	41,910	29,257
	Pounds	Value	Pounds	Value
Linseed oil, total	173,447	$14,056	9,960,961	$738,964
Germany	2,389	400	6,317,880	392,015
Netherlands	123,487	9,341	1,808,680	166,806
United Kingdom	12,809	1,105	1,645,569	159,458
Other countries	34,762	3,209	188,832	20,685
Soya bean oil, total	13,116,220	$823,619	19,489,129	$1,217,383
Germany	1,277,620	84,110	1,355,287	92,996
China	1,519,840	93,821	—	—
Japan	1,573,129	101,796	283,070	20,149
Kwantung	8,693,235	539,533	17,539,319	1,079,066
Other countries	52,396	4,359	311,453	26,152
Olive oil, sulphured or foots	39,546,684	$2,696,049	45,874,327	$3,127,948
Greece	2,343,247	199,236	1,742,833	153,847
Italy	17,130,274	1,393,957	40,815,523	2,825,441
Portugal	3,204,868	70,854	592,354	9,097
Spain	15,234,690	1,083,082	339,088	19,814
Algiers and Tunis	1,405,752	128,620	2,194,157	105,866
Other countries	227,853	20,300	190,372	13,883
Olive oil, inedible, other, total	8,723,823	$1,175,447	10,332,163	$1,339,209
Greece	919,669	118,224	2,661,292	367,229
Italy	319,391	36,797	726,544	78,817
Spain	5,203,555	713,713	3,638,809	457,429
Turkey	—	—	706,019	98,667
Algiers and Tunis	2,011,818	268,998	2,278,254	294,789
Other countries	269,390	37,715	321,245	42,273
Palm oil, total	169,227,565	$11,066,721	261,816,442	$17,499,776
Germany	10,169,105	697,004	11,211,141	845,525
United Kingdom	8,914,751	728,051	12,044,184	904,832
Dutch East Indies	27,400,228	1,944,476	45,030,370	3,254,467
Belgium Congo	26,414,749	1,938,091	36,066,594	2,498,718
British West Africa	83,281,639	4,914,656	144,772,340	9,183,913
French Africa	7,391,242	438,725	8,350,045	558,030
Other countries	5,655,851	405,718	4,341,768	254,291

(Table II continued on next page)

TABLE II (*Cont.*)

	1928		1929	
	Pounds	Value	Pounds	Value
Palm kernel oil, total	53,812,482	$4,369,100	69,909,169	$5,301,174
Germany	27,286,411	2,209,929	36,343,044	2,755,004
United Kingdom	24,919,034	2,034,657	33,443,705	2,536,705
Other countries	1,607,037	124,514	122,420	9,465
Vegetable tallow, total	5,341,424	$358,465	11,530,358	$811,830
China	5,314,087	353,154	11,386,765	797,625
Other countries	27,337	5,311	143,593	14,205
Perilla oil, total	2,010,957	$214,262	5,574,319	$637,962
Japan	1,092,957	117,187	2,193,385	253,248
Kwantung	918,840	97,075	3,380,934	384,714
Other countries	—	—	—	—
All other oils, free, total	86,775	$57,717	76,019	$52,909
All other oils, dutiable, total	7,761,591	$579,198	38,837,122	$2,895,191
Germany	1,612,372	98,320	15,174,523	1,145,142
Netherlands	235,634	21,484	3,101,963	291,168
Russia	—	—	1,118,669	73,867
United Kingdom	1,849,103	164,244	7,755,339	627,687
China	1,324,000	94,391	1,084,835	68,534
Japan	376,098	26,975	1,522,056	104,027
Kwantung	1,811,504	116,780	6,744,001	416,765
Other countries	552,880	57,004	2,335,736	168,001

TABLE III.
IMPORTS OF VEGETABLE OILS INTO THE UNITED STATES
JANUARY TO MAY 1929 AND 1930

	Jan. to May, 1929		Jan. to May, 1930	
	Pounds	Value	Pounds	Value
Olive oil, edible	41,383,333	$7,402,437	44,232,724	$5,507,045
China wood oil	42,955,879	5,389,987	49,658,954	5,723,348
Coconut oil	180,849,193	13,642,979	133,568,578	8,796,785
Olive oil, inedible:				
Sulphured or foots	24,189,550	1,633,327	28,335,097	1,372,051
Other	5,223,626	718,139	4,676,593	442,797
Palm oil	118,461,837	8,089,030	83,716,591	6,657,719
Palm kernel oil	34,917,169	2,765,501	14,498,732	949,562
Sesame oil	11,068,748	1,004,828	12,579,719	1,040,265
Vegetable tallow	6,450,766	467,818	2,825,296	174,019
Peanut oil	2,069,241	203,371	812,749	77,039
Rapeseed oil, (gallons)	1,082,711	704,580	975,491	555,867
Linseed oil	6,562,612	408,612	2,065,055	199,820
Soya bean oil	10,427,686	658,931	4,668,242	266,522
Perilla oil	3,838,519	434,494	5,421,749	521,682
Other expressed oils:				
Free	37,343	26,649	35,857	21,964
Dutiable	10,770,740	740,843	1,943,353	151,912

Imports of Rapeseed oil were somewhat larger than in 1928 but were not in line with other oils in gains made. Japan practically doubled its exports to this country and thereby assumed a position of primary importance as a producer and exporter of this oil to the United States. English supplies reaching this country were 36% under 1928.

Spain has been our principal source for Inedible Olive Oils (excluding sulphonated product) of late years. However, the price factor apparently favored Greek oils for imports from that country increased nearly threefold while Spanish exports to this country fell off about 30%. Italian oil imports were more than twice as great in 1929 as in 1928 while Turkey which sent no oil of this nature in 1928 was credited with 700,000 pounds last year. Total imports for 1929 were in excess of the previous year by 18%.

Soya Bean Oil

PRACTICALLY all of this oil coming into the United States is the crude product. The increase in imports last year fell but very little short of 50% of the total entering in 1928. Shipments to United States from Kwantung were somewhat more than 100% greater than 1928 which was swelled further by larger quantities received from Germany. On the other hand, China was not represented as in the past as one of our major sources of supplies and there was a sizable decline in Japanese exports to United States.

(*Turn to Page* 433)

Para Rubber Seed Oil

Contribution from the Oil, Fat and Wax Laboratory, Bureau of Chemistry and Soils, United States Department of Agriculture

By G. S. Jamieson and W. F. Baughman

THE tree *Hevea brasiliensis*, which is the source of Para rubber, is a native of the Amazon valley; but in the latter part of the nineteenth century it was planted in several tropical colonies of the British Empire. Cultivation in those lands and various other tropical countries has been increasing ever since. Today the greater part of the world's supply of crude rubber comes from the rubber plantations of Malaya, Dutch East Indies and Ceylon. These plantations now cover millions of acres. Small amounts of rubber are also produced in India, Saranak, Borneo, French Indo-China, Siam and various parts of Africa. The Para rubber tree produces a fruit which contains, as a rule, three seeds. On ripening, the fruit bursts, and the seeds fall to the ground. Plantations on which full bearing trees are growing produce approximately 300 pounds of seed per acre. The seeds, which average 3 grams in weight, consist, on the average, of about 50 per cent, by weight, of shell containing no oil and 50 per cent of kernel containing 40 to 50 per cent oil[2-a]. The number of the plantations that have come into bearing has been increasing rapidly of late, and the problem of finding use for the large quantity of seed produced has been gaining importance. It has been given especial attention by the Department of Agriculture of the Federated Malay States and by the Imperial Institute of England. Several reports have been issued by these two institutions[1-2].

Concerning the commercial possibilities of rubber seed, Spring and Day[1-a] reported that the oil possesses less drying power than linseed oil and that the press cake is a useful cattle food, although care is required in its use for immature animals. Eaton[1-b] extracted the oil from a consignment of 25¾ tons of whole seed. The yield of oil was 19.3 per cent. He found that the drying properties of the oil were poor but thought that it could be used as a partial substitute for linseed oil. His opinion was that it would be preferable to extract the oil from decorticated seed by hydraulic pressure. The Imperial Institute[2-b] submitted samples of oil for technical trials to a number of manufacturers using drying oils and reported that the results showed the oil to be somewhat inferior to linseed oil for paint and varnish making but that it could be used as a partial substitute. It was found suitable for the manufacture of soft soap and possibly for the manufacture of rubber substitutes. In the same report it is stated that "trials with the cake left after expression of oil from the seeds were arranged for . . . and the results clearly establish its value as a food for cattle." Gardner[3] made a number of drying tests on the oil and found it to be much inferior to linseed oil. Some of the physical and chemical characteristics were determined by the investigators already mentioned, as well as by Pickles and Hayworth[4], Trevithick and Lauro[5] and by six independent observers of American Society for Testing Materials[6]. All the analyses recorded show high acidity. The acid value ranges from 6 to 50; it usually is between 30 and 40.

Pickles and Hayworth (*loc. cit.*) reported that the mixed fatty acids consist of 86.0 per cent unsaturated and 14.0 per cent saturated acids; that the saturated acid fraction is composed of stearic and palmitic acids, and that the unsaturated acid fraction consists of 32.6 per cent oleic acid, 50.9 per cent linolic acid, and 2.5 per cent linolenic acid. Gardner (*loc. cit.*) found the hexabromide number to be 16.3, which is equivalent to 6 per cent linolenic acid in the total fatty acids. Oil solvent-extracted in the United States from kernels imported from Sumatra has been sold in the markets for several years. The statement in the Malayan Agricultural Journal[1-c] is interesting, "that an American corporation has offered to purchase seed in Malaya; that the seed is decorticated, the kernels dried and chemically treated to destroy enzymes and afterwards

bagged and shipped to America." Many experiments have been made in recent years at Sumatra with a view to treating the seeds so that a low acid oil might be obtained, but up to the present, in so far as we are informed, no satisfactory treatment has been discovered. In fact, the air-dried kernels shipped to this country without further treatment have so far given the best results.

A quantity of rubber-seed kernels was furnished by the Prosco Oils Corporation, Norfolk, Va. An analysis of the kernels by R. S. McKinney of this laboratory gave the following results: Moisture, 5.04 per cent; oil, 42.53 per cent. The oil was expressed in an expeller and filtered.

Chemical and Physical Characteristics

THE oil had a clear dark-red color but was lighter than the commercial solvent-extracted oil. The important characteristics are reported in Table I. The acid value (40.9) is equivalent to 20.6 per cent oleic acid. This acid value was determined soon after the oil was expressed, and nine months later it had increased only to 42.4. This indicates that the oil as it existed in the kernels was highly acid. The thiocyanogen-iodine number was determined by the Kaufmann method[7]. The hexabromide number[8] on this sample is practically the same as the value observed by Gardner (*loc. cit.*). The hexabromide precipitate melted at 179°-180° with darkening. After one recrystallization from amyl alcohol it melted sharply at 181° with no discoloration. The percentages of saturated and unsaturated acids were determined by the lead salt-ether method, and corrections were made for the small quantity of unsaturated acids that remains with the saturated acid fraction. The percentage of unsaturated acids also has been corrected for the unsaponifiable matter which separates with the unsaturated acid fraction. The percentage of saturated acids in the oil is 2.7 higher than the value calculated from the Pickles-Hayworth results, and the unsaturated acid percentage is 2.3 lower.

Unsaturated Acids

THE percentages of oleic, linolic and linolenic acids in the oil were calculated from the iodine number of the oil and the thiocyanogeniodine number according to the Kaufmann scheme (*loc. cit.*), which is based on the conclusion that free thiocyanogen quantitatively saturates two double bonds of linolenic acid and one double bond of linolic and oleic acids. The results from this calculation are given in Table II. The hexabromide number (percentage of hexabromide in total free fatty acids) is equivalent to 5.5 per cent linolenic acid in the oil. Evidently there are present at least two isomers of linolenic acid. Five and a half per cent of one forms a crystalline hexabromide, melting at 181°, and insoluble in ether, and 14.1 per cent of one or more produces hexabromide soluble in ether.

Saturated Acids

THE total saturated acids were separated from a portion of the oil by the lead salt-ether method and esterified by heating for eight hours, under a reflux condenser, with absolute methyl-alcohol which previously had been saturated with hydrogen chloride. The mixture of methyl esters which weighed 104.5 grams was subjected to fractional distillation under diminished pressure as follows: A preliminary distillation from a 1-liter Claissen flask divided the mixture into five fractions and a residue, and these fractions were redistilled from a 150 cc. Ladenburg flask. The data for the distillation is given in Table III.

The iodine numbers and the saponification values of the final fractions are recorded in Columns 2 and 3, Table IV. The iodine numbers measure the amounts of unsaturated acid esters which contaminated the fractions. From these values the mean molecular weight of the saturated acid esters in each fraction was calculated[10]. The results are given in Column 6. The mean molecular weights indicate the saturated acid esters that may be present in each fraction. Thus the value for the small Fraction I is slightly higher than the theoretical value for methyl palmitate (270.3) and indicates the absence of methyl myristate. The values for the first five fractions lie between the molecular weights of methyl palmitate and methyl stearate (298.4), from which fact it is concluded that the fractions contain these two esters in varying proportions. The figure for Fraction 6 which is between the theoretical values for methyl stearate and methyl arachidate (326.4) suggests the presence of the latter compound in the final fraction and in the residue. These deductions were confirmed by recovering the free fatty acids from several fractions and isolating them by fractional crystallization from ethyl alcohol. Palmitic acid, melting at 63°, was obtained from Fraction I; stearic acid, melting at 69°, was separated from Fraction 5 and arachidic acid, melting at 77° was crystallized from the residue. These melting points remained constant on further crystallization and were not altered when the isolated acids were mixed with equal portions of other samples of the respective acids, the purities of which had been established by elementary analysis. No myristic

acid could be detected in Fraction I, and no acid with a molecular weight higher than arachidic acid was found in the residue.

The quantities of the saturated acids in the fractions were calculated from the mean molecular weights of the saturated acid esters (Column 6, Table IV) and the theoretical molecular weights of the esters present. The results are given in Columns 7-12, Table IV. The percentage composition of the saturated acid fraction is recorded in Column 2, Table V. These values calculated to the basis of the original oil are given in Column 3, and the equivalent percentages of glycerides are shown in Column 4.

The results of the determination of the composition of rubber-seed oil are summarized in Table VI. This represents the composition of the oil before it became highly acid.

Discussion of Results

THE composition as recorded in Table VI suggests that the oil should have good drying power and in this respect should be superior to soya bean oil, which has a limited application in the paint and varnish industry when mixed with linseed oil. However, the commercial samples of the oil which have been submitted to drying tests by some of the investigators referred to above have been found to possess poor drying properties. It is probable that the high content of free fatty acids in the oils tested has been partly responsible for these reports. Gardner[3-a] expressed a similar opinion and to confirm it conducted the following experiment. Fifty grams of crude rubber-seed oil, with an acid value of 57, and 2 grams of glycerine were heated with 3 grams of lime resinate (as a catalyst) to 260° for 90 minutes. Water was given off, and the mixture darkened considerably. The product was found to have an acid value of 5.1, showing that esterification had take place. A small amount of cobalt drier was added to a portion of the resulting oil, and the sample flowed on a glass plate. It dried over night to a film more firm than one produced with soya bean oil which had been treated with cobalt drier.

Apparently rubber seeds are so sensitive that they die shortly after maturity, and then a considerable portion of the fatty acids are liberated from the glycerides by the hydrolytic enzymes in the seeds. If the oil is filtered soon after manufacture its acidity upon standing increases very slowly. Attempts are being made in rubber producing countries to find some way to prevent the formation of so much free fatty acids in the seeds. If future attempts prove successful the oil may find considerable use in the paint and varnish industry.

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TABLE I

RUBBER SEED OIL
CHEMICAL AND PHYSICAL CHARACTERISTICS

Specific gravity, 25°/25°	0.9185
Refractive index, 20°	1.4737
Acid value	40.9
Saponification value	191.8
Unsaponifiable matter (%)	0.8
Reichert-Meissl number	0.3
Polenske number	0.2
Iodine number (Hanus)	135.2
Thiocyanogen-iodine number	88.8
Hexabromide number	15.7
Saturated acids (corrected) %	16.0
Unsaturated acids (corrected) %	78.4
Iodine number of unsaturated acids	163.8

TABLE II

RUBBER SEED OIL

Unsaturated Acids	Acids in Original Oil	Glycerides in Original Oil
	%	%
Linolenic	19.6	20.5
Linolic	31.5	32.9
Oleic	27.3	28.5
	78.4	81.9

TABLE III

RUBBER SEED OIL
FRACTIONAL DISTILLATION OF METHYL ESTERS OF SATURATED ACIDS

	Fraction	Temperature °C.	Weight G.
Preliminary Distillation Under 5 mm. Pressure			
	A	172-7	18.90
	B	178	21.63
	C	178-81	23.00
	D	182-5	20.40
	E	188-98	18.40
	Residue		2.10
Final Distillation Under 4 mm. Pressure			
Fractions A and B mixed	1	162-7	9.30
	2	168-76	23.20
Fractions C and D added	3	180-2	21.60
Fractions E added	4	183-5	22.04
Residue added	5	186-91	17.65
	6	192-215	10.00
	Residue		0.64

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The International Situation in Oilseed Crushing

Summarizing Reports from Worldwide Sources to The International Conference of Oilseed Crushers

By FRANK MESSENGER*

THE International Association of Seed Crushers recently held at Hamburg, Germany, their Annual Convention which was attended by seed crushers, brokers and shippers from all the important seed producing and crushing countries of the world, with the exception of the United States. The Congress was presided over by Mr. John W. Pearson, of the British Oil and Cake Mills, and Mr. F. Phillippart, Vice President of the Grandes Huileries de Bordelaise. Resolutions were passed advocating changes in the existing contracts between shippers and buyers, and considerable time was given to the discussion of elimination of competition between the crushers. At the present time, the Margarine Union, with its numerous crushing plants in various countries, wields an important influence in the matter of price, although there still exist a large number of smaller crushers whom the Union desires to have come into line. The delegates of the countries represented submitted reports as to the conditions of the oilseeds trade in their respective countries. While every European country, with the exception of Great Britain and Switzerland, showed a considerable increase in crushing operations during the year 1929, as compared with 1928, crushers felt that their profits were not proportionate to the volume of business transacted. At the present time, the low price of oilcake is a disturbing factor and nothing can be hoped for in this respect, until the price of grain is on a better footing. The increase in production of oilseeds was given as the reason for the low price of the raw materials.

Extracts from the reports of the delegates of the countries represented were as follows:

Report from Belgium

THE imports of seeds show a slight increase on those of the previous year. Whereas in 1928 we have imported 213,821 tons,* the total for 1929 is 220,774 T., an increase of roughly 7,000 T.

To this should be added roughly 25,000 tons of home-grown linseed.

The imports of oils exceed the exports by about 30,000 tons. In 1928 the difference was about 20,000 tons. Our imports of cake have exceeded our exports by 108,000 tons, as against an excess of 109,000 tons in 1928.

The census of cattle shows that the number has dropped from 1,750,541 in 1928 to 1,738,348 on December 31, 1929, a decrease of 12,193 heads of cattle. The national Index Figure has risen from 852 to 897. Workmen's wages have been increased proportionately.

Crushing costs show an increase over the 1928 figures. We give below the average of those which have been communicated:

(a)	Milk Costs	18.30
(b)	Office & Administrative	6.75
(c)	Depreciation	3.05
	Belgian Frcs.	28.10 per 100 Kilos.

Transmission taxes and costs of sale have not been included in above.

Report from Denmark

ACCORDING to the official Danish statistics the foreign trade of Denmark in 1929 and 1928 shows the following comparative figures:

		Export		
	Import	Home Prodts.	For. Prodts.	Import Surplus
	Mill Kr.	Mill Kr.	Mill Kr.	Mill Kr.
1929	1,792	1,610	97	85
1928	1,734	1,541	112	81

As will be seen from these figures, an increase can be registered in both the import and export trade of the country. As regards oilseeds the total import in 1929 was 390,123 tons, as against 366,043 tons in 1928.

During the first three months of the year transactions in our line of business were seriously hampered by the then prevailing ice situation, and towards the end of the year

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* (N.B. All quantities expressed in T. of 1,000 Kg.).

the worldwide depreciation in the grain and foodstuffs market made itself felt. However, the year under review can as a whole be classified as fairly satisfactory from the point of view of the oilmillers. There has been no labor conflict of any importance in 1929 in Denmark.

Report from Egypt

THE quantity of cottonseed crushed during 1929 was 232,000 tons, as against 194,600 tons during 1928. The Oil produced was 39,400 tons, of which 11,950 tons were exported. The Cake produced was 190,200 tons, of which 182,700 tons were exported, and about 8,000 tons consumed in the country.

The cottonseed exported amounted to 370,500 tons, as follows: United Kingdom 331,600 tons, Continent 39,900 tons.

The "Crushing Margins" were maintained although being on the small side, while the quantity crushed in Egypt has greatly increased from 80,000 tons during 1913, to 232,000 tons during 1929, being a record year. Egypt is expected to increase its crushing owing to the New Tariff, which will slightly reduce the cost of crushing. The past year was marked by a continuous and smooth working, without any trouble whatsoever.

The Cotton Crop was abundant last year, the acreage having increased, owing to the Irrigation Scheme being extended and improved. The total yield of cotton was about eight and a half million cantars. The past winter was notable for the great difficulty experienced by all crushers in disposing of their cakes. The prices sagged away much below pre-war level, and stocks were accumulated in every mill all over the world. Consequently, the prices for cottonseed went down from £12 per ton in September to £7 during the winter. Cottoncake prices, which were over £7. 5. 0d. in September, went down as low as £4. 10. 0d. in order to find a sale.

The great financial crisis which started in America during the autumn soon spread over Europe, and finally reached Egypt. The Government attempted to rescue the situation by the purchase of large quantities of cotton on the open market, which contributed towards the stabilization of prices.

The Egyptian Government formerly charged 8½ per cent. Ad Valorem on all imported goods. On February 16, 1930, however, they adopted a more modern scheme, under which all articles are classified, and pay scheduled tariffs. As regards vegetable oils, the old duty of 8½ per cent. would represent about £3 per ton, while at the new rate it is a fixed duty of £6 per ton. The local soap industry will greatly benefit from the duty, and is expected to increase its production to the detriment of imported soaps. There are no statistics available giving the actual tonnage of soap manufactured in Egypt, but as near as can be estimated, it is somewhere about 20,000 tons per annum at present. The imports of soap during 1929 were 8,746 tons.

The Government has brought relief to all the industries of the country by reducing the duties on materials such as coal, presscloth, barrels, tins, sacks, machinery, etc. The "Trade Balance" for 1929 represents a total import of goods valued at £56,089,512, against £51,751,994 exported. The cotton exports represent about 80 per cent.

We hope and believe that Egypt is about to witness the dawn of a new era of progress, under which, by means of increased opportunities for both capital and labor, a greater wealth and prosperity will accrue not to the industrial world alone but to the whole community.

Report from France

THE year 1929, from the point of view of the French oil industry, must be considered as marked by two principal influences. The first has continued for several years, and consists of the increase of peanut oil which is tending to become in a large measure the type of the French oil industry, of which it represents a growing proportion which at the moment is about 60 per cent. The other influence is unfortunately a new factor which is not confined to France. It is the difficulty of selling the cakes at a normal price with, as a consequence, a growing pressure on the prices of fats imported or of other articles, the prices of which are not governed so directly by the prices of cakes. The causes are the same everywhere: a series of good crops, fall in the prices of cereals, feedingstuffs, etc. The prices of olive oil, tallow, palm oil, etc. have caused a difficulty for the oil crushing industry during the second half of 1929, necessitating a slowing down of the mills and the disappearance of margins of profit. Unfortunately, it seems almost certain that this state of things will continue into 1930.

During the year 1929 France imported a total quantity of 1,194,653 tons of oilseeds. This tonnage considerably exceeded that of 1928—1,116,601, and it is superior to that of 1913—1,090,000.

The import of peanuts in shell, although superior to that of 1928, does not reach the tonnage of preceding years; but, on the other hand, the increase in the import of decorticated

peanuts is considerable. With regard to all the other kinds of seeds, we note a slight extra value, which confirms the positions taken in 1928.

In short, the imports of oils and fats were 122,894 tons in 1929, against 133,443 tons in 1928; whilst the exports amounted to 107,683 tons in 1928, against 109,104 tons in 1929. The difference between the imports and the exports, therefore, amounted to 13,790 tons in 1929, and 25,760 tons in 1928.

The Index figure for the cost of living changed in 1929 from 547 during the first three months to 565 during the last three months, whilst the average in 1928 was 519.

Wages were for the oil industry, as for the most part of production, based exactly on the modifications in the cost of living as indicated by the Commission Prefectorale, that is to say, they varied considerably in different districts. It is the same thing in the case of the cost of other items of production, such as machinery, transport of raw material, etc., which vary considerably according to the district in which the mill is situated. One can say that the price of manufacture varies from 25 to 30 francs per 100 Kilos of seed, according to the nature of the latter, and, as we have just said, according to the district.

Report from Germany

DURING the year 1929 the crushing of oilseeds and nuts in Germany rose from 2,460,000 tons to 2,585,800 tons, that is 5.13 per cent. The production of vegetable oils and fats rose from 796,568 tons in 1928 to 824,489 tons in 1929, i.e. by 27,921 tons, or 3.51 per cent. The production of oils and fats and oil cakes from the inland crop is not included, as it is unimportant. For the year 1929 the inland crop of rapeseed and rubsen is estimated to be about 12,000 tons.

The import of oils and fats rose by 6,615 tons, the export by 49,350 tons, whilst the consumption in the country decreased by 14,815 tons. For 1929 the import amounted to 106,588 tons, the export to 236,675 tons and the consumption about 694,400 tons against 99,973 tons, respectively 187,324 tons, respectively 709,217 tons in 1928. The figure for export includes those oils and fats manufactured in Germany for account of people in other countries.

The production of oilcakes rose to 1,680,000 tons, against 1,583,790 tons in 1928. The imports increased from 546,622 tons to 554,651 tons, i.e. by 8,029 tons or 1.47 per cent.; the exports from 441,221 tons to 467,148 tons; i.e. by 25,927 tons, or 5.88 per cent. The quantity available for inland consumption rose from 1,689,193 tons to 1,767,525 tons; i.e. by 78,332 tons, or 4.64 per cent.

The oilcakes available for the demand in Germany are apportioned among the various kinds as follows:

	1929	1928
Soya meal	680,500 T	560,000 T
Peanut Cakes	368,400	398,000
Linseed Cakes	243,300	282,000
Copra Cakes	153,000 }	266,000
Palm Kernel Cakes	160,900 }	
Cottonseed Cakes	68,600	83,000
Sunflower Cakes	43,200	40,000
Others	49,000	61,000
	1,767,500	1,690,000

Report from Sweden

ECONOMIC and industrial conditions in Sweden during 1929 may be characterized as very favorable. The development in most industries has been favorable. With regard to foreign trade, all previous records have been broken.

Agriculture in Sweden, as well as in most other countries, has had a discouraging year owing to the falling prices in connection with the agricultural world-crises. After the various labor conflicts had been settled in 1928 peace has (with one exception of relatively small importance) been preserved throughout the year 1929, and until the time of writing. As this is written, however, strike has been declared in the wood pulp and paper industries, affecting about 14,000 workers.

With regard to labor, unemployment last year showed a record of low figures. Owing to the climatic conditions a seasonal variation is always to be reckoned with. The number of applications for work to 100 vacancies at the official labor exchanges was for January 1929, 241, and fell to a minimum in September of 127, to rise again in December to 203. The corresponding figures for 1927 (1928 is useless for comparison on account of the labor conflicts in that year) were 293, 143 and 243.

The official index for the cost of living has moved in the following way:

January 1, 1929	170
January 1, 1930	157
April 1, 1930	155

With regard to crushing costs they are estimated to have moved round 25/- per ton. There was no increase in wages during 1929. An increase of about 4 per cent. has, however, been operative from January 1, 1930. As in previous years Swedish crushers had to reckon with a very severe competition.

(To be Continued)

Causes of Deterioration of Fats and Oils

Exceedingly Small Changes Caused by Oxidation and by Micro-organisms are Sufficient to Produce Detectable Taints

By W. L. DAVIES*

IN THE case of edible fats and oils it can be generally stated that tests by taste and smell afford evidence of deterioration before it can be supplied by any delicate chemical test. There is, therefore, much room for investigation of conditions in a fat or oil which lead to its rapid deterioration. Our present knowledge is such that we can only detect rancidity and other taints, once they have commenced in the fat, by delicate tests for small amounts of end-products. There is no test available whereby two fats, say, could be tested for length of time within which they are likely to remain in a wholesome condition and there is no reliable test whereby one fat might be proved to have a lower keeping quality than another. What is required is a reliable method of detecting the *tendency* to deterioration before such deterioration is evidenced by taste and smell (*i.e.*, by organoleptic tests).

It is obvious that chemical tests for deteriorated fats are only of secondary or confirmatory importance if the deterioration has already been detected by the senses. As will be explained later, once deterioration of a fat has commenced the rate of its development is increased owing to the reaction being autocatalytic. Economically, the ideal test would be one on the fresh material, for the purpose of determining the comparative possibilities of future deterioration. Material showing poor keeping properties could either be consumed quickly or utilized for a purpose where future deterioration would either be checked or masked, whereas the material of good keeping quality could be kept for a favorable market or conveyed to localities of a character requiring such material. In any case, the risks attendant on deterioration of a material could be minimized were such a test for fresh material possible.

Reprinted from the Chemical Age

Nature of Deterioration

FATS and oils may be said to suffer deterioration from two main causes:—(*a*) Oxidation by atmospheric oxygen; and (*b*) Biological causes, through the agency of micro-organisms.

Oxidative deterioration sets in through the action of atmospheric oxygen, influenced by heat, light, acidity and the effect of catalysts, on the fat. Certain products are formed in the initial stages which spoil the taste and smell of the fat: the fat is termed "slightly off," after which deterioration proceeds rapidly to give a badly colored tallowy product.

Biological deterioration is the result of the activities of micro-organisms which contaminate the fat or oil. Although fat is not the ideal medium for general micro-organic growth, when contaminated it can support a modified form of growth where the metabolism of the micro-organisms is greatly changed from the normal. Certain products, *e.g.*, ketones and lower acids, are formed which confer an off-flavor, and such fats are termed rancid, or acid. By far the worst effect is that of various moulds which can form methyl ketones from the lower fatty acids; *e.g.*, from coconut oil by the action of the dry moulds (*Penicillium*, *Aspergillus*, etc.) there are produced methyl-amyl up to methyl-nonyl ketones, the odors of which confer on rancid coconut oil its repulsive smell.

Oxidation of Fats

THERE is conclusive evidence that the "chemical" deterioration of fats is due to oxidation, and that the primary effect is associated with the double bonds of the unsaturated fatty acid radicals of the esters composing the fat. This has mostly been studied with reference to the oxygen uptake of fats at constant temperature. When a sample of fat in contact with air or oxygen is connected to a

manometer and the absorption of oxygen with time measured, it has invariably been noticed that an appreciable period of time elapses before any measurable quantity of oxygen is taken up. This period, called the "period of induction," is the period required by the system to undergo activation and reach that "potential" necessary for the subsequent oxidation to occur. When this period is a prolonged one, as is found to be the case for pure, acid-free fats, a very small amount of oxygen is taken up, the tendency of the system to remain in the unoxidized state of the double bonds (of oleic and other unsaturated acids) being gradually overcome. Once the period of induction has been overcome, oxygen absorption increases at a measurable rate. The rate of absorption subsequently increases logarithmically, which indicates that the products of oxidation catalyze subsequent oxygen absorption; that is, the oxidation is auto-catalyzed. Even with ordinary fats at room temperature, the period of induction is very long, but by working at higher temperatures, *e.g.*, at 60° to 95° C., the period can be shortened to a few hours, depending on the state of the fat. In the subsequent logarithmic absorption, every 10° C. rise of temperature doubles or trebles the rate of absorption.

The practical significance of this period of induction is that it normally represents the time during which a fat will keep in a wholesome condition, and provided the fat is consumed or otherwise utilized within this period (prolonged, of course, at ordinary temperatures for pure fats and oils) deterioration will not occur. But conditions in the fat and in the storage of the fat have an effect in shortening this period.

Conditions Affecting Oxidation

THE conditions likely to catalyze the subsequent oxidation of fats have also the effect of shortening the induction period. These conditions enable the fat to reach the "trigger" stage in quicker time. Briefly the conditions favorable to a shorter induction period are:—Heat, light, acidity, other impurities and metallic catalysts; and the effect of very small traces of metals such as iron and copper has been found to be far greater than the effects of all the physical factors put together.

A higher temperature of storage has been found to shorten the period of "wholesomeness" of a fat. The increased mobility of the molecules, and a higher energy content of the system at the higher temperature, are undoubtedly the factors operating. The benefits of cold storage are evident.

Storage in glass vessels in sunlight causes a fat to oxidize much more quickly than if it is stored in opaque containers in the dark. Subsequent oxidation is also photo-catalyzed. Ultra-violet radiation is the cause of this difference. (The finely-dispersed fat in milk can deteriorate sufficiently on an exposure of two minutes to the radiations of a small mercury vapor lamp as to be detectable by taste; while after a ten minutes' exposure the milk is almost undrinkable.)

The higher the free-fatty-acid content of a fat, the shorter will be the induction period. The slow hydrolysis of fat which proceeds in the presence of free fatty acid, thus liberating other acids and glycerol, may be regarded as the cause of this phenomenon, particularly when the free acid is, as usual, predominantly oleic; and the simplification of the oxidizable molecule and its dispersion by mutual solution through the fatty phase are factors in hastening the period of induction. The effect in catalyzing the proper oxidation later is more marked than the others where acidity is concerned.

Effect of Other Impurities

LIPOIDS, usually found in association with fats proper in fats of biological origin before refinement, are conducive to a shortened period of induction. The lipoids are more active chemically than the fats, and are likely to suffer oxidation first. They are also more soluble in neutral salt solutions and other aqueous phases found in small quantities in all unrefined fats. The unsaturated fatty acids in the lipoids are therefore oxidized sufficiently to bring about a shortened period of induction. Where there is sufficient lipoid present in the fat to make its products of oxidation noticeable by taste or smell, an intermediate "taint" occurs. The lecithin of butter is quickly oxidized, the chlorine residue evolving noticeable traces of trimethylamine, resulting in the "fishy" flavor of cold-stored butter in commerce. The "fishiness" of butter is subsequently followed by "tallowiness," or oxidation of the fat proper, and bleaching of the pigment.

The occurrence of "foots" or "marc" in unrefined oils tends, for a variety of reasons, to make the period of induction shorter. The "foots" usually contain a lipase (which increases the acid value of the fat), and also free acids, which tend to liberate fat-soluble fatty acids, *e.g.*, oleic acid. The "foots" also contain protein decomposition products, which enter the trace of aqueous phase of the future refined material. The "foots" also are seats of normal micro-organic growth. The same ef-

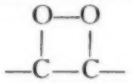
fect of non-fatty organic material in animal fats may be cited. Although, in cold storage, micro-organic growth may be depressed to a minimum, yet the products of micro-organic activity in contact with the fat accelerate the chemical action even at the low temperature.

By far the most potent agents inducing fat deterioration are small traces of metallic catalysts, present as soaps or other salts in the fat, which have entered the fat during processing or refining. The amount of metal necessary to bring about this deterioration is of the order of 0.5 to 10 parts of metal per million parts of fat, so that is can be seen that care in the use of metallic plant exposing copper and iron surfaces is essential. Copper is the most potent metal in this respect, while iron, manganese, nickel and cobalt are injurious, though less so than copper. For example, butter stored at 15°C. and containing 5 parts per million of copper (as lactate) developed tallowiness in 7 days, whereas 50 parts of iron per million was necessary to make the same butter tallowy in 9 days. The sample containing iron gave the intermediate taint of fishiness in 2-4 days. A control sample remained sound for six weeks (until moulds had shown their effects).

Acidity of the fat during refinement leads to a greater solution of injurious metals from containers and plant during processing, so that the refining of oils and fats at as low an "acid value" as practicable is advisable. The injurious metals undoubtedly act as oxygen-carriers, and, during the period of induction, very quickly confer on the system that "potential" necessary for the oxidation proper to occur. Their activity, once oxidation has started, is evident from the subsequent rapid deterioration of the fat.

Cause of Deterioration

THERE are many versions of the theory put forward to explain the auto-catalytic oxidation of fats. The primary step consists of the addition of a molecule of oxygen to the double bond of an unsaturated acid, *e.g.*



Thus, oleic acid forms oleic acid peroxide. This peroxide might break up in a variety of ways:—(*a*) A small amount of water might react with it, forming hydrogen peroxide, which would oxidize any foreign material, *e.g.*, protein degradation compounds or inorganic lipoid residue as in lecithin, or attack glycerine or a further fatty acid radical in the fat; (*b*) Water would react forming dihydroxystearic acid and liberating one atom of oxygen which could be used for further oxidation or the formation of an ozonide of an oleic acid molecule remote from a water film; (*c*) The oleic chain might be broken at the oxidized double bond to give nonaldehyde and azelaic semialdehyde—further oxidation of which would give nonoic and azelaic acids respectively; (*d*) β-oxidation of the portions of the broken oleic acid chain could give acids with two carbon atoms per chain less, *e.g.*, heptylic aldehyde or acid from nonaldehyde or nonoic acid; (*e*) The saturated fatty acids could be broken down in a similar manner to that of nonoic acid, to give a series of acids each differing by two carbon atoms.

Although reactions such as the above would result in the breakdown of some of the fat molecules, and should be detectable by a change in the constants of the fats (*e.g.*, iodine value), it must be borne in mind that the amount of change necessary to give a taint noticeable by taste and smell need only be very small, and such changes usually cannot be detected by changes in the fat constants. Indeed, very advanced deterioration is necessary before any appreciable and significant change in acid value, iodine value, or hydroxy-acid content can be observed in the fat under investigation.

In the case of linoleic and linolenic acids, whenever these are present in fats in small quantity, the short-chain compounds formed by the ruptures of the chains at the double bonds give compounds which enable the chemical tests for confirming oxidative deterioration to be carried out sooner than with fats free from these acids. The Kreis test, which will be described later, is thus useful for fats containing these acids. (Where large amounts of these acids are present, the fats exhibit the characteristics of drying oils, in being capable of forming a high content of hydroxy acids. These confer a quasi-carbohydrate nature on the molecules, enabling the mass to polymerize to a hard resin-like substance.)

(*To be continued*)

Wetting, cleansing and dispersing agents are composed of condensation products of fatty acids of high molecular weight and aliphatic, aromatic, hydroaromatic or heterocyclic amines or their derivatives or substitution products, along with soap or soapy substances such as Turkey red oil or sulfonic acids. Fr. Pat. No. 682,227.

Foreign Trade

(*From Page* 417)

Other Oils

A WORLD-WIDE short crop of linseed last year curtailed the tonnage of seed that would have been brought into the United States to supplement our own crop. As a result we drew heavily on the crushers of Germany, United Kingdom and the Netherlands who found it more profitable to sell their production to us than to offer it on European markets. Imports from Germany rose from a nominal quantity to a figure equal to two-thirds of our total imports which last year were 50 times greater than those of 1928.

The Netherlands and the United Kingdom also shared in this much increased volume of imports. Vegetable tallow coming mainly from China reflected a growth in import volume of 124%. Perilla oil imports, which trade was divided in the ratio of two to three between Japan and Kwantung, last year was rather more, one and one-half times larger than in 1928. Peanut oil, the only item to exhibit a decline in volume was about 30% less than in 1928, the greater part of this being attributable to shrinkage in supplies from China. In the miscellaneous group of "all other dutiable oils" which include all oils not mentioned specifically in the schedule, our imports were over four times those of the previous year. Half of this gain is accounted for by heavier imports from Germany and the balance scattered among the several other countries supplying us. China alone showed a lessened volume of exports to us.

1930 *Imports Decline*

IN TOTAL value imports of vegetable oils fell off roughly 8% for the five months period of January to May of this year when compared with a similar period for last year. The downward course of olive oil prices is well demonstrated by the fact that although the import volume of the edible quality was about 7% above the first five months of last year yet there was a shrinkage in value of 25%. The same held true for sulphur oils and foots of which the volume of our receipts was 17% greater this year than last while the value was 16% less.

Coconut oil imports were reduced in tonnage 20%; palm oil, approximately 30%; palm kernel oil, 60%; linseed and soya bean oils each about two-thirds; peanut oil 63%; vegetable tallow 56%. Gains were recorded in three Oriental oils, sesame oil about 15%; China wood oil 18% and perilla oil over 41%.

Evidently the importation of most foreign oils save olive oils has suffered a check due to two primary causes—a condition of overstocks still burdening our markets as a result of exceptionally heavy imports last year and lowered consumptive requirements.

Export Trade Improves Position

IN THE face of the price demoralization affecting the world's vegetable oil markets and indications of greater available supplies of many oils this year, it is encouraging to observe that the volume of our exports was 27% greater and the value a little less than 12% higher. This disparity between volume and value is possibly the explanation of our gain in exports for the average value of crude cottonseed oil exported during the first five months was .077 per lb. whereas for the same period last year the declared value was .08⅓ per lb.

An increased quantity, slightly under 9% more coconut oil was exported at a value of eight-tenths of a cent less per lb. Exports of vegetable soap stock showed the largest gain about 150% over the first five months of 1929 at an average of .01 per lb. reduction in value. A smaller increase was recorded in the case of corn oil. Exports of refined cottonseed oil declined in volume somewhat over 17% and in value nearly 24%. The situation as to value was reversed in the instance of linseed oil.

TABLE IV.
EXPORTS OF VEGETABLE OILS FROM THE UNITED STATES
JANUARY TO MAY, 1929 AND 1930

	Jan. to May, 1929		Jan. to May, 1930	
	Pounds	Value	Pounds	Value
Cottonseed oil:				
Crude	8,141,222	$678,472	14,153,183	$1,076,965
Refined	3,261,426	404,700	2,704,478	308,397
Corn oil	138,476	19,044	136,838	30,201
Other vegetable oils and fats edible	1,264,749	216,357	1,354,436	210,276
Coconut oil	9,164,287	785,142	9,955,146	768,417
Linseed oil	916,691	100,089	754,033	109,821
Soya bean oil	3,357,077	339,596	2,036,902	209,648
Vegetable soap stock	3,075,167	221,900	7,617,941	469,500
Other inedible oils and fats	2,661,876	229,126	1,742,858	152,734

Notes of the Industry

Nut Oil Concession in Panama

The Republic of Panama has granted a concession to an American corporation, by the terms of which the latter is authorized to establish a plant to extract the oil of the Corozo nut, which is a variety of the palm species, and to gather these nuts from the national lands of the Republic, and to obtain them by purchase from private landowners. The concession is for 25 years, during the first five of which the American corporation is exempt from paying any portion of its income to the Panamain government. During the second five year period it is to pay one percent of its profits, which payment is to be increased one percent during each of the five year periods following. The Corporation is granted the right to import all machinery and equipment free of charge. A supplemental agreement has been signed, subject to the approval of the Assembly, exempting the Corporation from all other taxes during the life of the contract. Report from American Minister, Roy T. Davis at Panama City.

General Foods Sells Troco

An arrangement between General Foods Corporation and Durkee Famous Foods, Inc., food subsidiary of The Glidden Co., was announced recently in a joint statement by Colby M. Chester, Jr., President of General Foods, and Adrian D. Joyce, President of the Glidden Company.

Under the newly announced arrangement, General Foods Corporation will in the future distribute and sell certain food products manufactured by the Glidden organization, thruogh the channels of General Foods Corporation's extensive truck distribution system.

Chief among the products of Durkee's Famous Foods which will be handled under the new arrangement is the well-known brand of Troco nut margarine One or two other of the Durkee products will also be handled in a more limited way by the General Foods trucks, but the plan for Troco calls for nation-wide distribution, which has previously been accorded on the trucks only to Hellmann's mayonnaise and related products.

The Troco brand was recently acquired by Durkee's from The Colgate-Palmolive-Peet Company, to whom it passed with the ownership of the Palmolive Company. Troco was first marketed in 1916 by Troco Nut Butter Company, a subsidiary of the Palmolive Company, and was the first nut margarine for which national demand was developed.

Water Softening Merger

The interests of the Permutit Company, of New York, and the Ward-Love Pump Corporation, of Chicago, manufacturers of boiler-water softening and treating equipment and processes, have been merged in a newly organized Delaware corporation to be known as General Water Treatment Corporation. W. Spencer Robertson, President of the Permutit Company, will be President of the new Corporation and Francis N. Bard, President of the Ward-Love corporation, will be Chairman of the Board. General Water Treatment Corporation will have an authorized capitalization of 500,000 shares of common stock without par value.

Suit Over Bean Dust

An injunction has been issued by Judge Gosline of the Lucas County, Ohio, Court of Common Pleas, against the operation of a castor bean pomace grinding plant by the Toledo Seed and Oil Company, a subsidiary of the Archer-Daniels Midland Company. The injunction was issued in connection with a test suit, one of 150, brought by a woman who claimed that she had contracted asthma in the mill. A statement issued by an officer of the company states that production of castor oil will continue unhampered by the injunction. The statement points out that the grinding plant is equipped with a dust-collecting system and that there is every reason to believe that any genuine cases of asthma concerned in the suits were not caused by dust from the grinding plant. Furthermore, it is believed by the management that in many of the suits the alleged affliction is spurious and would not stand the test of medical examination.

The Refinery Supply Co., Tulsa, Okla., brought from the press in September its bulletin No. 15, containing a description of Ac-me and R. S. specialties in scientific and power plant equipment. Copies of the bulletin may be obtained from the company at 621 E. Fourth St., Tulsa, Okla.

RUBBER SEED OIL

(*From Page* 421)

TABLE IV

Results of Analyses of Fractions Obtained by Distilling Methyl Esters of Saturated Acids

Fraction	Iodine Number	Saponification Value	Mean Molecular Weight	Esters of Unsaturated Acids %	Mean Molecular Weight of Esters of Saturated Acids	Palmitic Acid %	Palmitic Acid g.	Stearic Acid %	Stearic Acid g.	Arachidic Acid %	Arachidic Acid g.
1	1.5	206.4	271.8	0.96	271.6	89.55	8.33	4.38	0.41		
2	1.5	202.1	277.6	0.96	277.5	69.77	16.19	24.27	5.63		
3	1.9	198.6	282.5	1.22	282.3	53.52	11.56	40.35	8.72		
4	2.7	193.3	290.3	1.73	290.3	26.63	5.87	66.90	14.74		
5	3.1	188.9	296.9	1.99	296.9	4.65	0.82	88.74	15.66		
6	3.4	186.0	301.6	2.18	301.8			81.57	8.16	11.71	1.17
Residue									0.12		0.45
							42.77		53.44		1.62

TABLE V

RUBBER SEED OIL

Saturated Acids

	Acids in Saturated Acid Fraction g.	Acids in Saturated Acid Fraction %	Acids in Original Oil %	Glycerides in Original Oil %
Palmitic	42.77	43.72	7.00	7.3
Stearic	57.10	54.62	8.74	9.1
Arachidic	1.62	1.66	0.26	.3
	101.49	100.00	16.00	16.7

TABLE VI

COMPOSITION OF RUBBER SEED OIL

		Per Cent
Glycerides of	Linolenic acid	20.5
	Linolic acid	32.9
	Oleic acid	28.5
	Palmitic acid	7.3
	Stearic acid	9.1
	Arachidic acid	0.3
	Unsaponifiable matter	0.8

Statement of the ownership, management, circulation, etc., required by the Act of Congress of August 24, 1912, of Oil & Fat Industries, published monthly at New York, N. Y., for Oct. 1, 1930.

State of New York, County of New York.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Alan Porter Lee, who, having been duly sworn acording to law, deposes and says that he is the Editor of the Oil & Fat Industries and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse side of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publishers, MacNair-Dorland Company, Inc., 136 Liberty St., N. Y. C.; Editor, Alan Porter Lee, 136 Liberty St., N. Y. C.; Managing Editor, None; Business Manager, Grant A. Dorland, 136 Liberty St., N. Y. C.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

MacNair-Dorland Co., Inc., 136 Liberty St., N. Y. C., Grant A. Dorland, 136 Liberty St., N. Y. C., Ira P. MacNair, 136 Liberty St., N. Y. C.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholders or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is ..... (This information is required from daily publications only.)

[Signed] Alan Porter Lee.

Sworn to and subscribed before me this 24th day of September, 1930.

Al. J. Ruggiero, Notary Public, Kings Co., No. 509, Reg. No. 1162; Cert. filed in N. Y. Co., No. 309, Reg. No. 1R242; Commission expires March 30th, 1931.

Apparatus designed to permit the measurement of the foam volume of soap solutions consists essentially of an aspirator bottle connected with a foaming tube immersed in the soap solution. Five hundred cc. of water are allowed to flow from the bottle in thirty seconds, thus drawing air through the solution. The foaming power varies with the concentration of the soap, there being two maxima, one at a concentration of 0.2-0.5% and the other at 0.8-0.9%. Temperature has little effect upon the position of these maxima. Solutions of the sodium soaps of castor oil fatty acids foam very little, even when heated. Addition of soda ash raises the foaming power of castor oil or rosin soaps. *Maslob Zhirov. Delo,* No. 2 (55), 40-4 (1930).

OIL & FAT INDUSTRIES

The Editor's Page

Depression? — or Inattention

INDUSTRY in general, and the fatty oil producing and manufacturing interests have not proven exceptions, has just passed through a most difficult year. There is hardly anyone in our country who will sigh at the passing of 1930 and most of us are looking forward to the dawn of a new year with the hope that business will take a decided turn for the better.

In reviewing the events and conditions of 1930, however, we wonder if the country's managers of businesses have not to a certain extent allowed themselves to be led into a timid state of mind by the cry of "Wolf-wolf." Have we not, all of us, been inclined to take our economic lessons from the wrong teachers, the stock markets, for example, rather than from the progress of general trade around us?

According to the United States Census enumeration just completed, on April 1st, 1930 there were nearly 123,000,000 people in this country, and every one of those people is a potential purchaser and user of any necessary product the country produces, as well as a hopeful prospect for those products which fall into the luxury classification. These American people have succeeded in raising the average standards of living in this country to a place far above that of any other nation or people in the world's history and it is idle to think that these living standards will ever be abandoned or reduced in the United States or Canada.

All during the "Depression" of 1930, of which we read so much in the contemporary news, the roads have seemed just as crowded with automobiles, the railroads have not cancelled limited trains, the theatres and moving-picture houses have had capacity audiences, the radio broadcasters have continued their aerial advertising; in short, Life in America has continued about the same.

Those American manufacturers who have kept their eyes away from the Stock Market and who have labored earnestly to cultivate their own domestic markets with the people of the United States, have stayed in business and will stay in business, and will grow as the country grows.

It is, of course, in times like these that the pressure of competition is felt most strongly by those who, for lack of attention to scientific progress, have allowed themselves to fall into the category of marginal producers; whose processes and machinery will not permit them to produce their products of competitive quality or at competitive costs. They are inevitably lost in the dark forest of Depression, for lack of the lamps of Applied Research.

If we then, all of us, will go about our daily business in 1931, with renewed determination to advance and to progress by the sheer force of strict attention to business and neglect of disquieting rumors, we cannot fail to see a splendid revival of business, which will, we hope, be held within the bounds of reason for the very avoidance of repetition of a following "Depression."

Europe Crushers to "Cooperate"

THE European crushers of vegetable oils are not making sufficient profit and they plan to take steps to increase their margin if reports which were rendered before the convention of the International Association of Seed Crushers recently at Hamburg are to be taken at their face value. "Closer cooperation between the members with a view to the elimination of competition" is the way a report of the meeting stated the aims of the oil producers. Although it was also explained that the elimination of competition was chiefly planned in the purchase of seeds and other materials for crushing, there is every reason to believe that success there would mean an extension of the policy to cover the selling prices of oils.

No American crushers are members of the Association and none were represented at the meeting. At the same time, the activities of European producers have a direct bearing on the American markets. There is no doubt that the overproduction of vegetable oils in Europe and Asia, including also the overproduction of seeds, has been

a prominent factor in the low prices for oils and fats which have been ruling in the United States for the past year. The possible effects in the United States of any "elimination of competition" abroad are obvious. If the crushers of Europe are to increase their profits, it is apparent they will have to do it by paying less for raw materials or selling finished oils at higher prices, or both. If their talk of "cooperation" is not just so many empty words, and definite arrangements are made to control prices, American oil crushers and soap makers may view some significant developments in the course of the next year.

Borneo Tallow Analysis

The Borneo tallow examined (from trees of the genus *Shorea,* mainly *Stenoptera, Dipterocarpaceae*) had m.pt. 36-36.5°C., solidification pt. 28.8°C., saponification equivalent 290.7, iodine value 32.3, and contained 0.74 per cent. of unsaponifiable matter. The methods of analysis used were as for cocoa butter (Analyst, 1929, 54, 242), and the composition of the mixed fatty acids was: Myristic, 1.5; palmitic, 21.5; stearic, 39.0; and oleic acid, 38.0 per cent. Oxidation of the tallow with potassium permanganate in acetone solution showed the presence of 4.5 per cent. of fully saturated glycerides containing 6 per cent. of unsaponifiable matter, and the fatty acids consisted approximately of 57 per cent. of palmitic and 43 per cent. of stearic acid; as with cocoa butter, the palmitic acid appears to be relatively concentrated in the fully saturated glycerides in spite of the preponderance of stearic acid in the total fatty acids. The deduced component glyceride structure of the tallow showed that 95.5 per cent. of the fat consisted of mixed saturated-unsaturated glycerides, with saturated and unsaturated acids in the molecular ratio of 1.55:1. Mono-oleo-glycerides must form at least 78 per cent. of the fat, which cannot contain more than 17.5 per cent. of dioleoglycerides or more than 8.5 per cent, of triolein, and this was confirmed by experimental examination of the acidic products of oxidation of the tallow. A possible approximate composition of the tallow is: Palmito-stearins 4.5, mono-oleodisaturated glycerides (mainly oleopalmitostearin) 85%; dioleomonosaturated glycerides 6.5, and triolein 4 per cent. Slightly more fully saturated glycerides and definitely more mono-oleo-glycerides are present than in cocoa butter, and there is also probably more oleodistearin. These slight differences account for the somewhat higher m.pt. and tendency to granulation shown by Borneo tallow, but the results bring out the similar features of glyceride structure which render the two fats specially suitable for confectionery purposes. *J. Soc. Chem. Ind.,* 1930, 49, 196—200T.

Shortening and Oil Prices

Prices of shortening and salad and cooking oils on Wednesday, Nov. 26, 1930, based on sales made by member companies of the Shortening and Oil Division of the National Cottonseed Products Association, were as follows:

Shortening

	Per lb.
North and Northeast:	
Carlots, 26,000 lbs.	@10¼
3,500 lbs. and up	@10½
Less than 3,500 lbs.	@11
Southeast:	
3,500 lbs.	@10
Less than 3,500 lbs.	@10½
Southwest:	
Carlots, 26,000 lbs.	@10¼
10,000 lbs. and up	@10¼
Less than 10,000 lbs.	@10¾

Salad Oil

North and Northeast:	
Carlots, 26,000 lbs.	@10
5 bbls. and up	@10¼
1 to 4 bbls.	@10¾
South:	
Carlots, 26,000 lbs.	@ 9¾
Less than carlots	@10

Cooking Oil—White

⅛c per lb. less than salad oil.

Cooking Oil—Yellow

¼c per lb. less than salad oil.

Herman Aspegren, Vice-President of Portsmouth Cotton Oil Refining Corporation, Portsmouth, Virginia, has accepted our invitation to become a member of the Editorial Advisory Board of *Oil and Fat Industries.* Mr. Aspegren has been a member of the American Oil Chemists' Society for many years and has been an active contributor to research and experimental work on the refining of oils, the development of shortening products, and the combatting of oxidation and deterioration in fats.

Oil Chemists' Fourth Annual Fall Meeting

Midyear Session at Chicago Surpasses All Records for Attendance and Scientific Interest

THE Fourth Annual Fall Meeting of the American Oil Chemists' Society was held at the Congress Hotel, Chicago, Illinois, November 13th and 14th, 1930.

The meeting was attended by oil chemists representing oil producers and refiners and soap manufacturers from all parts of the United States and Canada, all those attending expressing satisfaction with the convenience of the Midwest metropolis as a central meeting place and more particularly with the splendid program of most interesting papers which was prepared by President W. H. Irwin with the cooperation of the local committee on arrangements, and of Vice-President Archibald Campbell, Chairman of the Soap Section.

The first day's Meeting was under the auspices of the Soap Chemists' Section, Chairman Campbell presiding and most of the papers presented on that day had particular bearing on those phases of oil and fat chemistry which refer particularly to the problems of the soap manufacturer and the soap chemist. The reports of the three committees of the Soap Section, the Detergents Committee, Glycerin Analysis Committee and Soap Analysis Committee were also presented during the first day's session.

Among the papers read at the first day's meeting were the following: "The Determination of Water in Glycerols," by L. F. Hoyt; "Lecithin—Its Effect Upon the Hydrolysis of Fats," by R. B. Trusler; "The Determination of Total Fatty Acids in Soap, Using a Modified Stokes Flask" by A. K. Church; "Some Impressions of European Soap Industry" by Archibald Campbell; "Technique of Bleaching Oils and Fats in the Laboratory" by J. T. R. Andrews and "Soybean and Linseed Oil," by Otto Eisenschiml.

At the conclusion of Thursday's session of the meeting, all members and guests present attended an informal luncheon held in a private dining room of the Congress Hotel. President Irwin introduced as the Guest Speaker Bruce K. Brown of the Standard Oil Company of Indiana, a well-known chemical engineer and patent attorney. Mr. Brown chose as the subject of his talk, "The Avoidance of the Obvious" and by means of well-chosen examples counseled his hearers to refrain from overlooking obvious solutions to their problems in chemistry and engineering through excess of zeal for thoroughness which often defeats itself by "avoidance of the obvious." Mr. Brown's friendly, informal address was much enjoyed by all his audience.

Thursday afternoon was devoted to visits to manufacturing plants, museums and other points of interest in the Chicago district. Among the industrial establishments which welcomed the visitors were included the meat packing plants at the Chicago stockyards, the Corn Products Refining Co., the Illinois Steel Co., the oil refineries at Whiting, Indiana and others. The museums visited included the Field Museum of Natural History and the Chicago Planetarium. For Thursday evening the local committee arranged a bowling tournament, which was held at the Stevens Hotel, and which aroused considerable interest among those present. A more detailed report of the tournament is given elsewhere in this issue.

Second Day's Session

PRESIDENT IRWIN presided at the second day's meeting on Friday, November 14th and the scientific and technical papers presented related particularly to edible oils and their products, shortening, salad oils, and margarine. Several treatises had reference to the important problem of keeping qualities of edible fat products and their resistance to rancidity and to oxidation. The following papers were included in the program: "Recent Technical Developments in the Margarine Industry,"

by B. R. Harris; "Function of Shortening in Baking", by H. S. Mitchell; "Corn Oil—Its Preparation and Usefulness", by G. A. Moore; "Certain Basic Considerations in the Solvent Extraction of Vegetable Oils", by C. F. Eddy; "The Measurement of Consistency in Hydrogenated Shortening", by A. D. Barbour; "Antioxidants", by F. C. Vibrans; "A Review of the Methods of Testing Rancidity and Stability in Shortening", by W. O. Pool; "New Method of Determining the Keeping Quality of Shortening by Measuring the Volatile Oxidation Products", by D. P. Grettie.

At the conclusion of the session all those present congratulated President Irwin, Vice-president Campbell and the Committee on Arrangements on the exceptional success of the meeting. There were over one hundred and twenty-five persons attending the meeting. Those registered included:

J. T. R. Andrews, Ivorydale, O.; A. D. Barbour, Toronto, O.; E. J. Bennett, S. Bend and San Antonio; R. E. Blake, Chicago; J. S. Boros, Chicago; John S. Boulder, Cincinnati; L. C. Brown, Chicago; S. H. Carroll, Chicago; Archibald Campbell, Cincinnati; Henry J. Cary-Curr, Chicago; R. M. Chapman, Hammond, Ind.; Carl W. Christensen, Chicago; V. Conquest, Chicago; H. E. Corman, Toronto; R. W. Cornell, Red Wing, Minn.; C. C. Dennis, Chicago; Frank J. Delany, Chicago; H. C. Dormitzer, Chicago; M. M. Durkee, Decatur, Ill.; E. W. Eckey, Cincinnati; Otto Eisenschiml, Chicago; Clarence Estes, St. Louis; Clarence F. Eddy, Norfolk, Va.; Clemence Foerster, Chicago; W. E. Guiney, Cambridge, Mass.; A. Guillaudeu, Chicago; B. H. Gilmore, Joliet, Ill.; Truman M. Godfrey, Cambridge, Mass.; M. B. Graff, Ivorydale, O.; G. G. Grant, Chicago; Arne Gudheim, Portsmouth, Va.; D. P. Grettie, Chicago; John P. Harris, Chicago; M. L. Hartley, Chicago; R. C. Hatter, Louisville, Ky.; G. W. Holbrook, Chicago; L. F. Hoyt, Buffalo, N. Y.; Benj. R. Harris, Chicago; W. H. Irwin, Chicago; G. V. Hallman, Chicago; F. E. Joyce, Omaha, Nebr.; R. E. Kistler, Chicago; H. R. Kraybill, Lafayette, Ind.; Alan Porter Lee, New York; C. E. Lennox, Joliet, Ill.; Raymond P. Lutz, Chicago; Ira P. MacNair, New York; Duncan McIntosh, Zion, Ill.; H. S. Mitchell, Chicago; G. A. Moore, Argo, Ill.; A. Ernest MacGee, El Dorado, Kans.; P. E. Minton, Chicago; John P. Moser, Cambridge, Mass.; C. Robert Moulton, Chicago; James M. O'Hara, Chicago; T. H. Petersen, Chicago; G. H. Pickard, Chicago; W. O. Pool, Chicago; A. W. Putland, Chicago; R. W. Perry, Toronto, Canada; N. A. Ruston, Cincinnati, O.; W. J. Reese, Kansas City, Kans.; Albert D. Rich, Chicago; A. S. Richardson, Cincinnati; Louis M. Roeg, Rahway, N. J.; A. A. Robinson, Chicago; A. E. Schaar, Chicago; V. Serbell, Portsmouth, Va.; M. L. Sheely, Chicago; Herbert Sieck, Chicago; Evan A. Sigworth, Tyrom, Pa.; Otto A. Sjostrom, Chicago; T. E. Skeppstrom, Portsmouth, Va.; Paul L. Stern, Clinton, Ia.; W. L. Taylor, Chicago; L. M. Tolman, Chicago; H. P. Trevithick, New York; R. B. Trusler, Dayton, O.; Frank C. Vibrans, Chicago; J. J. Vollertsen, Chicago; W. T. Watkins, Chicago; D. L. Weatherhead, Chicago; Glenn D. Wiles, Chicago.

Apparatus and Chemical Exhibits

THE local committee on arrangements provided an interesting array of exhibits of laboratory apparatus and chemicals, the exhibitors including the following:

E. H. Sheldon & Co. Muskegon, Michigan, displaying examples of the Sheldon line of laboratory furniture.

Skelly Oil Co., El Dorado, Kansas, exhibiting special solvents produced from petroleum for laboratory and plant extraction purposes.

Laboratory Construction Co., Kansas City, Missouri, showing a complete line of Kjeldahl digestion and distillation battery equipment and other laboratory specialties.

Rascher & Betzold, Chicago, Illinois, presenting a general line of laboratory apparatus and glassware.

E. H. Sargent & Co., Chicago, Illinois, displayed items from their own complete line of apparatus and chemicals, giving particular prominence to the American Oil Chemists' Society official moisture oven and to an improved battery of electrically heated extraction apparatus.

Central Scientific Co., Chicago, Illinois, showed their newly designed special electric heaters and ovens, together with other *Cenco* specially designed laboratory apparatus.

Merck & Co., Rahway, New Jersey, displayed an attractive assortment of C. P. and analyzed chemicals for laboratory use.

A. Daigger & Co., Chicago, Illinois, exhibited a complete line of laboratory apparatus and glassware. Of particular interest to the visitors was the Daigger laboratory hydrogenation apparatus, an ingeniously designed small converter suitable for experimental hydrogenation or deodorization.

Bowling Tournament

THE Oil Chemists' Bowling Tournament, held in the Recreation Parlors of the Hotel Stevens, under the skilful management of John P. Harris, was most successful and was thoroughly enjoyed by all of the members and guests who attended.

The following teams participated in the bowling contest: Procter & Gamble Ivories, Swift Harold Teens, Swift Premiums, Swift Silver Leaf, Armour Stars, Armour Armoritas, American Maize Amaizos, Industrial Chemical Nuchars, A. Daiggers, Schaars, Wilson Bakerites.

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Causes of Deterioration of Fats and Oils

Exceedingly Small Changes Caused by Oxidation and by Micro-organisms are Sufficient to Produce Detectable Taints

By W. L. Davies*

Part II

Tests for Auto-oxidation

THE course of oxidation has been followed by chemical methods. One of these consists in seeking the presence of one type of end product, *e.g.*, an aldehyde, by means of decolorized magenta (Schiff's reagent or the Fellenberg test). The Fellenberg test is a very delicate one, especially when it is carried out on the fat in petroleum ether solution. A slight trace of aldehyde can be detected by a faint coloring (magenta) of the interface between the aqueous and the ethereal layer. In on case has this test been given by a fat before evidence of deterioration was plainly detected organoleptically. On the other hand, it has been found useful for chemically confirming a suspected taint of milk, due to deterioration of the milk fat, the cause of the taint being slight oxidation of the fat at low temperature.

A second method is to take advantage of the color formed by some aldehydes when they combine with phloroglucinol and the presence of hydrochloric acid (*e.g.*, the furfural test). The Kreis test is carried out as follows:—An ethereal solution of the fat is mixed with an ethereal of phloroglucinol and the whole shaken up with an equal volume of concentrated hydrochloric acid. An oxidized fat will give a red coloration of the aqueous layer, the depth of color depending upon the degree of oxidation. The test has been found to be due to the formation of the phloroglucide of epihydrin aldehyde (one of the possible aldehydes from glycerol oxidation). The test can be obtained with a dilute solution of glycerol oxidized with acid bichromate in the same way. Acrylaldehyde will not give the test except in the presence of hydrogen peroxide. This test, again, in no case gave a positive result until the deterioration of the fat was plainly evident to the senses.

A third method lies in the estimation of the "oxidizability values" of the steam-volatile or the water-soluble products of oxidation. This is carried out by obtaining the products, oxidizing them with acid permanganate, and calculating the number of milligrams of oxygen necessary to oxidize the same products from 100 grams of fat. These determinations are, of course, only roughly comparative, and are laborious and cumbersome when the amount of information they offer is considered. The determination of the "oxidizability value" of the water-soluble products is the simpler to carry out, and consists of keeping 25 g. of fat in contact with 100 cc. of water at 80°C. (on a waterbath) for two hours, filtering, oxidizing an aliquot portion with excess of acid N/100 permanganate (boiling for exactly five minutes), and estimating the excess permanganate with N/100 oxalic acid.

These tests have been found useful in following the rates of proper fat oxidation under varying conditions, but have been found valueless in detecting incipient deterioration. As stated above, the search for a variation in constants of the fat is only of use when deterioration has been going on for a considerable time. Such determinations afford a rough indication of what processes have occurred during the prolonged auto-oxidation of the fat.

Increase in Acidity

WITH slow fat deterioration there is a slow increase in acidity. This brings about a state of acid rancidity. This is more marked when auto-oxidation occurs in a fat system catalyzed only by the products of oxidation. If, by some means such as the introduction of

* *Reprinted from the Chemical Age.*

a powerful positive catalyst (or pro-oxygenic agent) such as a trace of metal the oxidation is speeded up, it will be found that the couse of oxidation is turned towards the formation of end-products without the accompanying formation of free fatty acids. This brings about a state of "tallowiness" in the fat, conferring on it not the sour deterioration of fat but a neat's-foot oil odor. (A parallel case occurs with biologically induced rancidity; a pure cuture of a dry mould will give a pleasant ketonic odor at the start, but when other moulds enter this is destroyed by acid formation, replacing the ketonic rancidity by an acid rancidity which is much more nauseous.)

There is thus a difference in effect produced when oxidation only is powerful, as against oxidation coupled with free-fatty-acid formation. This is important in detecting the cause of bleaching and tallowiness in butter. An advanced state of deterioration and discoloration without high acidity invariably points to metallic contamination of the stored butter, whereas high acidity and acid deterioration point to poor storage of the butter, *e.g.,* exposure to too high a temperature and to light, and high initial acidity of the product. Micro-estimations of copper and iron in such butters have borne out this view.

Tests for Keeping Quality

THE factors which catalyze oxidation proper in a fat also shorten the induction period. Therefore, in a sample of fat which will have a short life in the wholesome state, there is a factor (which possibly could be detected by a method using an external indicator) which is as yet latent but which will in time show its presence both in shortening the induction period and in catalyzing the oxidation proper. The main properties of this agent or factor lie in the fact that it can carry oxygen to the double bond of the oleic acid residue, thus initiating the oxidation, and this formation of peroxide takes place to a small extent when any fat is exposed to the air. The amount of peroxide formed is usually too small to be determined quantitatively, but its presence can easily be demonstrated by the usual peroxide tests, *e.g.,* the blueing of guaiacum and the indophenol test.

An attempt has been made to demonstrate the varying tendency to oxidation (owing to the small amounts of catalyst present) by studying the degree to which leuco-methylene blue can be oxidized by atmospheric oxygen through the agency of these catalysts. In testing a series of fats, the fat, emulsified in fat-free milk, is reduced (free of peroxides) along with dilute methylene blue by the reductase of the milk flora. On shaking the white liquids after reduction is complete (as evidenced by a state of total bleach) with air for a definite time and allowing a definite time of standing (usually two minutes), a variation in the degree of restoration of the blue color can be observed. This degree of restoration varies directly with the keeping quality of the fat—the deeper the blue color restored, the shorter time will the fat under consideration remain in the wholesome state. This test has been found useful in detecting traces of metals which in a short time will cause tallowiness in fats (*e.g.,* butter). Further work on the oxidation potentials of fat emulsions should prove useful in this direction.

High temperatures hasten the progress of fat oxidation enormously. Hence, by working at high temperatures, it should be possible to obtain information as to the relative lengths of the periods of induction for a series of fats. This could be accomplished: (*a*) By determining the lengths of the periods of induction of the fats at 90° C., using an oxygen uptake apparatus, which could be fitted with a kymograph registering mercury levels in the free manometer tube at atmospheric pressure; (*b*) Samples of fats could be exposed at 90° C. in open dishes, the time of heating necessary for the sample to give either a positive Fellenberg or a Kreis test being noted. These tests are used considerably in determining the keeping qualities of samples of lard. Despite much investigation, our resources for grading fats according to keeping quality are still small.

Biological Deterioration

FATS are of biological origin. Their non-aqueous nature naturally precludes them from being suitable media for the growth of micro-organisms. Nevertheless, micro-organic contamination might modify the usual process in the contaminating organism so as to cause sufficient breakdown of the fat molecule to be detectable by taste and smell.

In the growth of any organism a source of energy is an all-important factor. An aerobic organism gets its energy by burning organic matter during the process of respiration. If that respiration is impeded, then some organisms will derive their energy by fermentative processes. An organism contaminating an oil or fat will have its cell wall coated with a layer of oil or fatty acids and its respiration will be modified. It will then seek energy anaerobically, namely, by attacking some of the glycerine of the fat or fatty acids. The liberation of glycerine needs an enzyme, "lipase," which is present in variable amounts

in various organisms. A variation in effect on fats, therefore, is to be expected from different organisms, and this is actually the case.

It must be pointed out at the outset that the decomposition of fats by micro-organisms is of a different nature from that described above for the auto-catalytic oxidation of fats(called chemical deterioration). Also it is interesting to note that if micro-organisms are present in fats, no auto-catalytic oxidation will occur. Any available oxygen in the fat will be used up by the micro-organisms. This can be shown by suppressing the proliferation of micro-organisms in an already contaminated fat, *e.g.*, either by cold storage or other means, and examining the nature of subsequent change. In all cases auto-oxidation will occur, and tallowiness will gradually set in. This is the main cause of the totally unexpected deterioration of cold stored butter. Whereas it was thought that depression of micro-organic growth would save the situation with respect to butter storage, the conditions resorted to immediately favored an equally disastrous change, especially when auto-oxidation was so realily catalyzed by the minute traces of heavy metals which had entered the material during processing.

The same remark applies to milk. The souring of milk causes the greatest loss in the trade, and this has been overcome by endeavoring to keep the milk at as low a temperature as possible during transportation and storage. The fat in milk presents an enormous surface for oxidation, and in such cases, where traces of copper have entered the milk during treatment (*e.g.*, from copper coolers), a taint termed "oiliness" develops on occasion when such milk is kept in the cold. The depression of bacterial growth by ultra-violet radiation must for this reason be carried out with care. The activation of dissolved oxygen soon makes its effect apparent on the milk fat. There would be less risk if the flora of the milk had had an opportunity of consuming the dissolved oxygen before irradiation.

The Effect of "Foots"

THE purity of a fat or oil has a marked effect on its keeping quality. Generally, for good keeping quality, an oil should have a low free-organic-acid content and complete absence of extraneous aqueous material such as "foots." Where vegetable oils are extracted from the seed, a certain amount of protein material finds its way into the crude extract. This protein material is usually rich in a fat-splitting enzyme (lipase) derived from the embryo, and this enzyme was originally intended for breaking up the seed fat to supply energy to the growing embryo. In the presence of "foots," therefore, a certain amount of fat-splitting will occur, and there will be a rise in acid-value, which will be detrimental to the keeping quality of the fat when subsequently separated from the "foots." The use of damaged seed for oil crushing has the same effect. This fat-splitting is the more evident in commerce with the cereal oils and olive oil.

Bacteria: Surface Tainting

THE activity of any organism in a medium depends on the use it can make of the substrate. With fat as medium, part of the resultant activity will depend on the accommodative power of the organism to utilize the substance at its disposal under the existing conditions. On bacteria, fat will generally exert a modified bacterio-static effect by coating the cell wall with a non-aqueous layer of material. Other factors governing the welfare of the organism are its lipolytic activity, the toxicity of products of lipolysis (*e.g.*, the fatty acids) and its power of dealing with these products; the presence of foreign material in the fat, such as proteins and soluble organic acids (lactic and succinic); the amount of water; and its proximity to atmospheric oxygen. These factors govern the welfare of any micro-organism, whether aerobic, anaerobic, or micro-aerophyllic.

Comparatively speaking, deterioration of fat due to bacteria is not so marked as that due to higher organisms, such as moulds, largely owing to the fact that they have not the same property of extending mycelium or extruding aerial fructifications, neither have they the high accommodative powers of the moulds. The worst cases of deterioration occur where atmospheric oxygen can reach the organisms. This gives rise to the phenomenon of surface tainting, where fat in contact with atmospheric oxygen is broken down to yield products which are repulsive to taste and smell. The general change is that of methyl-ketone formation, as will be described below for moulds. At the surface there may also be detected a change in acid value. That the organisms are respiring can be detected by aerating off the carbon dioxide formed over a lengthy period. In their slow action on fats, it seems noteworthy that the organisms have a selective power as to the isomeric form of unsaturated acid which they will attack, and this is invariably the cis-form. Oleic acid is readily attacked, while its isomer, elaidic acid, is not. The destruction of bacteria in fats by sterilization is a questionable process, as some organisms are heat-resistant when coated with a layer of fatty acid or calcium soap. Taints in sterilized milk are attributed to this fact.

Moulds

MOULDS are the organisms which cause most deterioration in fats and oils, since they are less specific and more accommodative than bacteria. Their action on fats, also can be much more readily followed. Moulds, in their action on fats, are divided into two classes: (*a*) Those which preserve the solid consistency of the butter; and (*b*) Those which have strong lipolytic properties and liberate much fatty acid, mostly oleic acid, thus rendering the fat oily.

To the first class, the higher fatty acids in a free state are toxic, and consequently, the lipase content of these organisms is not high. On the other hand, the lower fatty acids, from capric acid downwards, are not toxic, and these are acted on; the effect of these "dry" moulds on fats containing appreciable quantities of these acids, *e.g.*, butter-fat and coconut oil, is interesting. The process consists of β-oxidation of the acid to form first the secondary alcohol and then the methyl ketone containing one carbon atom less:

$$CH_3(CH_2)_n\ CH_2CH_2COOH \rightarrow$$
$$CH_3(CH_2)_n\ CHOHCH_2COOH \rightarrow$$
$$CH_3(CH_2)_nCOCH_3 + CO_2.$$

Thus caproic, caprylic and capric acids liberated from the fat by lipolysis are changed into methyl amyl, methyl heptyl, and methyl nonyl ketones respectively. In small amounts, these ketones have the odor of coconut, but in larger quantities, their presence becomes repugnant to taste and smell. There is very little increase in acidity with the development of the taint, and oleic acid present in the free state has a retarding effect on the growth of the above moulds in fats. Following through the changes in the Reichert-Meissl and Polenske values of the fats when acted upon thus, it is quite easy to see what acids are being broken down. Among the active moulds are *Penicillium, Aspergillus,* and *Cladosporium.*

The second class of moulds, the acid-formers, act in a different way. They have a high lipase content, and the higher fatty acids do not poison their mycelium. They break the acids down, again by β-oxidation, to lower fatty acids, each losing two carbon atoms in each step of breakdown. Oleic acid is formed in large quantities in such cases, giving the fat a lower solidifying point and the free fatty acids a high iodine value. The capacity of these moulds to oxidize the acids is much stronger than with the previous class. Lipoids in the fats are also oxidized, usually before the fat proper is greatly acted upon. *Oidium* and *Oospora* are examples of this type of mould. These can break down butter lecithin to give fishy butter, whereas the "dry" moulds break down the curd to give a cheesy taint to the butter. The breakdown of the fatty acids occurs simultaneously for all of them, as there is no predominance of one class of fatty acid mounting up during prolonged activity of the mould, except oleic acid, which is the result of vigorous lipolysis of the olein. This acid, in the free state, may be used as an oxygen carrier for the moulds.

Very little is known of the effect of yeasts on fats. A distinct ester smell (ethyl butyrate) may be generated in milk from lactose fermentation and lipolysis of butyrin of butter-fat, but such cases have not been noted in butter-fat or butter. The relation of temperature of storage and micro-organic activity to the process of fat deterioration is of importance. Where the temperature favors micro-organic growth, auto-oxidation is precluded, while at low temperatures, where micro-organic growth is depressed, auto-oxidation will proceed. The remedy, therefore, is to refine the fat in such a way that the amounts of mould and of catalysts for auto-oxidation are at a minimum in the product. Butter is a striking example of this. The more the raw material is processed, the more will metal of a deleterious nature enter it. Pasteurization overcame some of the faults, only to show that on cold storage favorable conditions for auto-oxidation obtained.

A study of the chemical equilibrium during fat splitting and fat saponification, applying the mass $K = (G)(S)^3/(F)(W)^3$, in which G is glycerol, S fatty acids or soap, F is fat and W is water or caustic soda, shows that the highest degree of splitting, after equilibrium is reached, depends upon the temperature and composition of the fat and not upon the type of process employed. It also shows that under the same conditions of reaction, the percentage of splitting is greater, the greater the original amount of water present. The constant K in relation to temperature is found from the formula lok $K = (q/4.573T) + c$, where q is heat of reaction, T is absolute temperature, c is a constant, and 4.573 is the product of the gas constant and the conversion factor of natural logarithms into ordinary logarithms. *Allegem. Ol-Fettztg.* 27,114-5 (1930). *Chem. Abstr.* 24,494-6 (1930).

Wilson & Bennett Mfg. Co., manufacturers of steel containers, Chicago. are now constructing a new three-story office addition to their factory.

SHORTENING— Its Baking Function

Selection of Proper Shortening Material and Its Use in Suitable Manner and Quantity of Highest Importance in Production of Bakery Products

By H. S. MITCHELL*
Swift and Company

IT WOULD be quite impossible to fully cover the subject assigned me in the short time available. I will, therefore, confine my remarks to the use of shortening in the commercial bakeshop and cover as many of the individual bakeshop products as the time will permit. It is interesting in passing to note the advances which have been made in recent years in the baking industry. Only a comparatively few years ago, the baker just baked. His equipment was unsatisfactory. He paid little attention to the quality of ingredients used or to the methods of mixing followed in the shop. The main object at that time appeared to be to get the product out of the oven regardless of the quality. As a result of these conditions, the bakery business was far from profitable. Eighty percent of the bread consumed was baked in the home because the baker's product was of such poor quality that the houselife would not buy it. The leaders of the industry, urged on by the competition of the housewife, launched a campaign having for its purpose the transfer of bread baking activities from the kitchen to the commercial bakeshop. That this campaign was entirely successful is evidenced by the fact that today over eighty percent of the bread consumed is produced in the commercial shop and less than twenty percent in the kitchen. Women who bake bread now are considered old-fashioned indeed and this is really as it should be. There are too many worth while activities available to the women of the present day to ask them to spend their time in the kitchen making bread or any other baked product. The story of "The capture of the bread business from the housewife," as I like to call it, is an extremely interesting one. Education of the individual baker was the principal means of accomplishing the desired result. It was impressed upon him through every possible channel that he was getting only a small part of the possible business. He was then informed as to the quality of ingredients necessary to make a loaf which would be comparable to that made in the kitchen by the housewife. The methods of mixing and baking were improved and standardized. The result of this educational campaign was that the time came eventually when the lady of the house could purchase a loaf of bread over the bakery counter which was equal or even superior to her own. She, therefore, gladly conceded the struggle for supremacy in bread baking to the commercial shop. Unfortunately, this same statement cannot be made with respect to cake. Approximately eighty percent of the cake consumed in this country today is now baked in the home. The cake baker has the same problem now that the bread baker had fifteen years ago. He must improve the quality of the cake which he offers the housewife until it is equal or superior to the one which she now prepares for the family herself. Then and then only will the product of the commercial shop replace that of the kitchen oven.

I bring these facts to your attention because we as producers of materials used in baking have a definite duty to perform in connection with the bakers' problems. We must first furnish quality ingredients most suitable for the purpose intended. If the baker is to compete with the housewife's cake, for example, he must use ingredients of the same quality and also of the same character as she does. If a shortening with a characteristic flavor will produce a better baked product than one with

* *Presented at Fourth Annual Fall Meeting American Oil Chemists' Society, Chicago, November 14.*

no flavor then we should so inform the baker if we are to help him increase his business. We must always remember that there is no universal shortening. There is, however, a certain definite type of shortening which may be selected as most satisfactory for each definite bakeshop product and we should see to it that the baker makes this selection from facts rather than from high pressure salesmanship or claims which cannot be substantiated. We must also assist the baker in developing types of cake, in improving his methods of mixing, and even in the merchandising methods which he may use in putting across to the housewife his story of improved product. His problems are our problems for as we help him increase his distribution we are creating a greater demand for our own products.

Qualities of Bread

BREAD may well be the first bakery product to consider. The principal ingredients used in its manufacture are flour, water, yeast, sugar, shortening and salt. The framework of the loaf is the gluten which is formed from the protein of the flour, and the leavening agent is the carbon dioxide gas produced from the fermentation of the sugar by the yeast. The amount of shortening used in bread will vary from two to three percent, based, as the baker calculates percentage, on the basis of the flour. Sliced bread, which just now enjoys a quite extensive distribution, carries a somewhat higher percentage in order that drying out or staling may be delayed. It is found that the total score of the loaf increases rapidly up to two percent of shortening. From two to three percent there is a somewhat slower improvement which is followed by a rapid decline. The small percentage of shortening present in bread does not, of course, permit of any startling effects upon the loaf. There is, however, a noticeable improvement in the character of the crust with the increase in shortening content. A loaf baked without shortening would have an extremely brittle crust. This brittleness decreases with the addition of shortening and is replaced by the much desired tender crust which results from the lubricating effect of the fat. Shortening very materially reduces the loss in weight which takes place in the first few hours after the loaf is baked. This leads to an improved keeping quality which enables the commercial baker to put his loaf on the consumer's table with a freshness equal to that which would be found in the loaf baked in the kitchen oven by the housewife. Shortening improves the crust color. It adds a very desirable brilliancy to the golden brown color produced by the caramelizing of the sugar in the oven heat. The texture of the loaf is rapidly improved up to two percent shortening with a slower improvement with additional amounts. The crumb of bread made without shortening is harsh and rough but the addition of shortening in proper amounts leads to a very desirable, smooth, silky texture which is quite marked when taken into the mouth and might well be called "chewability." If a shortening such as lard which carries a characteristic flavor is used in bread the flavor as such does not carry through into the finished baked loaf. Salt, sugar, malt, and yeast, however, all lose their individuality in the loaf but all contribute toward the final flavor. The same is true of lard. Many of the important bread bakers prefer lard because it not only produces a very satisfactory pliable crust and a smooth, silky texture but also improves the flavor of the finished loaf.

Bakery Specialties

NEXT, let us consider the doughnut because this is a doughnut month and the start of that season of the year in which this product contributes quite appreciably to the income of the commercial bakeshop. Shortening is used in the dough batch and also as the frying medium with this class of bakery products. The fat, as in the case of bread, contributes to the texture of the product and produces that desirable chewability. It does not, however, contribute toward the flavor or taste because of the high seasoning usually used in this type of baked goods. Baking powder furnishes the leavening in the making of doughnuts and the cooking is accomplished in deep fat which is maintained at a temperature of 380° to 390° F. The shortening to successfully carry out its function as a frying fat must have a high smoke point so that it will not give off appreciable fumes at the temperature of frying and must be resistant to oxidation so that it will retain its life under the quite unfavorable conditions to which it is exposed.

Cake is probably the most interesting bakeshop product which we will consider in discussing the function of shortening. It is surprising, indeed, to search the literature and find so little material covering the fundamentals of cake making. As stated earlier, the baker enjoys only a small part of the possible business in this class of bakery products. Much work is being done, however, in the effort to change this condition and this work will undoubtedly be eventually successful. Before the goal is reached, however, the housewife must be convinced that the cakes she carries home from the corner shop are as good as those she has made with her own hands. She must be relieved of the suspicion that the ingredients used

in the bakeshop are of inferior quality and not marketable as first-grade products. She must not be asked to serve a product which reeks of cheap flavor. The goods must be presented to her in an attractive manner and in a fresh condition. All of these requirements are of extreme importance to the baker especially at the present time and must constantly be kept in mind when considering any phase of the baking business. With this picture before us, let us consider briefly the production of cake and the role which shortening does and will play in the struggle for the housewife's business.

Class of Cakes

THERE are three general methods of producing cakes. We have that class which depend upon beaten eggs for their lightness and are known as sponge cakes. The small percentage of shortening which is used in this type adds considerably to the eating quality. Then there is that class which makes use of an inorganic leavening agent in addition to creamed shortening and beaten eggs. The layer and loaf cakes are usually found in this class. Last, and most important of all, is that group of products which depends for its lightness upon the creaming and emulsifying power of the shortening. The procedure followed in making a cake of this latter class is to place the sugar and shortening in the bowl and incorporate air by creaming or mixing. This forms a foamy mass, the volume of which is, in the case of certain shortenings, more than double the volume of the original mass. When the sugar-shortening mixture has been sufficiently creamed, the eggs, milk, and flour are added in such a way that the foamy structure is not broken down. The dough going into the oven, therefore, contains finely distributed particles of air and moisture. The air, of course, when exposed to the heat of the oven expands and thus partially explains the increase in volume of the cake. This expansion was formerly taken to be entirely responsible for the cake volume. It has been recently pointed out, however, that the maximum expansion possible of the air present in the cake batter under the conditions of increased temperature taking place in the oven falls short by a considerable volume of accounting for the expansion which actually takes place in a cake made without chemical leavening. This means then that some other factor must enter into the leavening action. It is apparent that the vaporization of the moisture contributes more to the final cake volume than the expansion of the air. Shortening plays a very important part in the building of a batter which will produce the most satisfactory results. It furnishes a medium for holding air in the creamed mass. It also assists in building up a satisfactory cell structure so that the water may be distributed in such form that its vaporization may produce not only maximum volume but also even grain. It is quite probable that the so-called creaming qualities of a shortening have in the past been overemphasized. The mere ability of a shortening to give maximum volume when creamed with sugar does not necessarily indicate that it is the most suitable for cake work. Its ability when creamed with other ingredients to render the greatest assistance in the holding of air and water in suitable cell structure is the important function. There are, of course, a number of factors in the treatment of the shortening-sugar mass which will appreciably influence the final results regardless of the ability of the shortening to cream and build up cell structure. Among the more important of these are temperature, speed of mixing machine, granulation of sugar used, and rate of addition of other ingredients. It is interesting to note in this connection that as more and more attention and thought are being given to the baker's problems in cake making, particularly by the technical men of the Allied Trades, that the older ideas and methods are being seriously questioned. For example, it has been believed that the proper method for producing pound cake must start with the creaming of the sugar-shortening mixture. Today there is a school which holds that this operation is unnecessary and that the same results may be obtained with much less trouble and with more uniformity by placing all of the ingredients together in the bowl and mixing to the proper consistency. The work on this method in our own Experimental Bakery has indicated several serious objections, the principal one being loss of volume. Another method of handling cake mixes has been proposed recently and appears to offer much promise. I refer to the mixing of the batter under pressure. We have been able to produce a very satisfactory cake with this method and find that a very close control of the finished cake characteristics may be secured by controlling the specific gravity of the finished cake batter.

It is quite possible that the creaming and cell forming function of shortening will continue to be fundamental in the new methods of mixing which are being brought to the attention of the baking industry. On the other hand it is within the realm of possibility that the old theory will be completely overturned and shortening made to play an entirely different

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The International Situation in Oilseed Crushing

Summarizing Reports from Worldwide Sources to The International Conference of Oilseed Crushers

By FRANK MESSENGER*

PART II

Report from Italy

THE total amount of all seeds and nuts imported into Italy during 1929 was 3,887,798 Quintali (1 Quintale equals Kilos 100), which, compared with 3,438,017 in 1928, shows an increase of Q1,-449,781.0, viz. about 13 per cent.

The production of seed oils subject to tax amounted to Ql. 1,157,563, against Qli. 950,648 in 1928, the said figures including all the edible seed oils.

The imports of vegetable oils were as follows:

	1929	1928
Peanut oil	Qli. 37,731	Qli. 81,888
Rape oil	595	1,372
Cotton oil	1,626	1,482
Linseed oil	13,013	1,372
Castor oil	645	406
Sesame oil	87	275
Soya oil	37,055	142,782
Others	44,635	39,359

The approximate output of cakes, including meals of extracted seeds, amounted to Qli. 1,950,000. Of same, 1,377,373 were exported.

Last year has been an exceptionally bad one for the Italian trade of seed oils. The peculiar conditions of Italy concerning edible vegetable oils made the state of trade certainly worse than in any other seed crushing country. A survey of said conditions is an item of very great interest. Olive oil is one of the most important agricultural products of Italy; its amount is not sufficient, however, to cover the domestic consumption in edible oils, same being about 2,700,000 Quintali, and the average crop of olive oil amounting to 1,600,000 Qli. The balance, including the exports of olive oil, is covered by seed oils.

It is easily understood that when a huge olive crop is followed by another still more abundant, the olive oil prices must be necessarily depressed, and the unsold stocks become heavy in a very serious degree. A relief for this cannot be found in an increase of export of Italian olive oils, because the huge crops of other Mediterranean countries, especially of Spain, have much more depressed the international market. The result has been an alarming accumulation of stocks in olive oil, as well as in seed oil mills. An intervention of the Government has been requested from olive growers, with the result that after careful consideration of the matter, the Cabinet has thought that from the national point of view the Italian olive oil production deserved a further protection. The measures adopted by the Italian Government have been the following:

Prohibition of selling mixtures of seed and olive oils (the so-called "miscelati"), prohibition of every artificial coloration of seed oils, every edible seed oil must be added with 5 per cent. of sesame oil, giving the well-known characteristic chromatic reaction in order to make same readily identifiable. The import duties of seed oils have been increased as follows: Peanuts up to Goldlire 6.90: rapeseed, 5.46: gingellyseed, 6.90: soya beans 2.55, per 100 Kilos. A corresponding increase has been established on imported seed oils, viz: Pea nut Goldlire, 29.50: Rapeseed oil, 29.50: Sesame oil, 29.50: Soya 39 per 100 Kilos. The fabrication tax on seed oils has been brought from Lire 15 up to Lire 65 per Quintale. It has been a heavy burden indeed for the seed oils trade: it is to be hoped that the olive oil market will improve to a degree sufficient to establish the normal margin between itself and the seed oils. Needless to say, the fiscal and custom conditions both for technical oils or seeds for their fabrications are unaltered.

* *U. S. Foreign Trade Commissioner at London. Widely-known Authority on World Trade in Oils and Oilseeds.*

The Index numbers compiled by the Council for National Economy of Milan were 496.3 in January, 1929, 480.3 in June, 459.2 in December, expressed in Lires. Same expressed in Goldlire have been respectively: 134.7, 130.3, and 124.6. The base for both computations is 100 in 1913.

We are sorry not to be able to state particulars of crushing costs as desired. Approximately the crushing expenses for modern equipped mills can be expressed as follows:

Mill expenses	Lire 18	per Quintale
Office Administration	4	" "
Selling expenses	2	" "

Report from Norway

REGARDING the oil and fat industries in Norway the predominant factor is the whaling companies of Norway. During 1929 Norway has sent out more whaling expeditions than in any previous year. Expeditions have been sent out by large new companies, and the expeditions of the old companies have to a very great extent been modernized. The catch has been very large—the largest ever registered. During the year there has been built one new oil-mill in connection with De Nordiske Fabriker De-No-Fa A/S's works at Fredrikstad. This oil mill has as from the 1st of January, 1930, been taken over by A/S Lilleborg Fabriker, who previously have oil mills in Oslo and at Stavanger. The official price index is little by little declining. During the year there have been very little labor troubles.

The imports of vegetable oilseeds and oils have been the following:

	1928	1929
Copra	20,863 tons	23,782 tons
Linseed	16,465	14,673
Rapeseed	863	1,616
Coconut oil	6,025	5,848
Cotton oil	1,269	1,201
Peanut oil	3,404	3,513
Soya Bean oil	5,147	6,392
Linseed oil	1,447	1,952

Report from Great Britain

THE total import of all oil seeds and nuts for 1929 was 1,546,099 tons, which, when compared with the total of 1,553,426 tons for 1928, shows a decrease of 7,327 tons.

Taking the cake equivalent of imported oil seeds and nuts, and adding the tonnage of imported cakes, after deducting the exports of cakes, the figures show the amount of cake available for consumption in the United Kingdom for the last three years, as follows:

1927	1,337,461 tons
1928	1,353,650 "
1929	1,476,212 "

The imports of cakes show an increase of 111,899 tons, and exports show a decrease of 27,002 tons, which are, to say the least, very discouraging figures.

The imports into, and exports from, the United Kingdom, of vegetable oils for the last two years were as under:

	Imports in Tons		Exports in Tons	
	1928	1929	1928	1929
Palm Oil	52,212	59,688	3,881	3,445
Palm Kernel Oil	991	5,753	18,926	16,767
Cottonseed Oil	7,494	9,958	16,004	24,010
Rapeseed Oil	1,896	4,349	6,518	5,512
Linseed Oil	22,515	31,093	22,021	20,056
Castor Oil	3,349	3,696	7,869	7,917
Soya Bean Oil	24,667	14,755	21,865	18,018
Coconut Oil	63,340	64,807	4,379	5,186
Other Seed Oils	43,055	57,034	21,803	22,842
	219,519	251,133	123,266	123,753

The imports, therefore, showed an increase of 31,614 tons, and exports an increase of 487 tons.

Briefly reviewing the past year the first six months were certainly an improvement on the same period of the preceding year, the crush throughout the country being increased, resulting in lower working expenses. The dry summer also increased the demand for manufactured feeding stuffs, and during the summer months large sales of cakes for forward delivery were made. There is no need to comment on the subsequent heavy fall in the prices of all raw materials, and as the prices of all grain followed in the same way, the British farmer, whose financial position has not improved, was compelled to use his own produce to a great extent in the place of cakes, the result being that a proportion of the straight cakes and a still greater proportion of the compound cakes sold for forward delivery, will never be taken up. It is on the compound cakes that the losses will be especially heavy, as they were again sold with the "Fall Clause" and manufacturers have had to reduce the prices as they have been delivered from time to time, and in some cases will, no doubt, be left with dear raw material on their hands owing to the very much reduced demand. This, of course, resulted in the crush being considerably reduced for the last six months of the year.

The crushing costs for the whole year have, however, been reduced a little, and a fair average might be taken as 30/10d. per ton, made up as follows:

	Per Ton s	d
A. Mill Expenses		
1. Power	3	5
2. Wages	11	4
3. Repairs and Renewals	3	3
4. General Charges	3.	10
B. Office Administration	6.	3
C. Selling Expenses	1.	6
D. Depreciation	1.	3
	30.	10

It is pleasing to report that the industry has again been free from labor troubles throughout the year, any matters that have arisen having been settled amicably by the Joint Industrial Council, composed of representatives of the Employers and Employes. For the first nine months of 1929 the rate of wages was, as previously, governed by the Sliding Scale, but during the course of the year there were only minor fluctuations. For January-March the wages rate remained unchanged, the average index figure for the previous quarter being exactly 67 per centage increase. The Average for January-March was 66, which occasioned no change, for April-June quarter, in wages. The average figure for cost of living for April-June fell to 61, which would have entailed a reduction of 1/- per week for the quarter July-September. At this stage, however, the Joint Industrial Council made a recommendation that the reduction should not be made operative in view of the prospect of intermittent employment. This recommendation was generally adopted. The Index figure for July-September gave an average of 62⅔, involving no change in rate. On September 25, 1929, the Joint Industrial Council, after careful consideration, decided to discontinue the existing method of fixing wages, and to stabilize the rates for a period of one year. It was thought that this would prove to be more satisfactory both to employers and employees. The Council recommended that stabilization should take place at an advance of 1/- per week on current rates, thereby placing the rate of wages 2/- above the actual sliding scale rate. At the end of the year the Index figure for October-December showed an average of 66⅓ per centage increase.

The Reports presented to the Conference in the past might be summed up in their order as follows:

Bad: not satisfactory; less satisfactory; slightly better; very unsatisfactory; bad as possible; not good but closing brighter; no worse and more hopeful for the future.

It is, therefore, to be regretted that this Report again closes on a very low note, as, while our imports of oilseeds and nuts during 1929, as shown at the beginning of this Report, show very little decrease on the previous year, the stocks at the end of the year must have been heavy owing to the reduced consumption of cakes and other feedingstuffs during the latter period of the year. One could continue this tale of woe into the current year, but it most be borne in mind that this is a Report for 1929, and, consequently, it must close as at December 31 in the hope that, while the opening chapter of the Report to next year's Conference cannot be cheerful, the close will be brighter.

While prophecies often go astray, and while fully realizing that agriculture is, and is likely to continue, in adversity, it might, however, not be out of place to put on record, that not for many years have many of our raw materials been at so low a figure, which if maintained would enable manufacturers to offer to the farming community, cakes and meals, at a sufficiently attractive figure to at least increase their attention towards those commodities we make, in preference to those cereals which they have been compelled to consume themselves, in ever increasing quantities, to the detriment of the crushing industry.

Report from Switzerland

THE official Swiss import statistics show a total import of oil seed of 30,244 tons for 1929, as against 31,610 tons in 1928, which means a decrease of 4 per cent. The imports of the various oilseeds were as follows:

Copra	6,200 tons	equals	4,000 tons	of	coconut oil
Peanuts	19,600 "	"	8,400 "	"	peanut "
Linseed	4,400 "	"	1,320 "	"	linseed "

The imports of oils and fats into Switzerland were as follows:

	1928 Tons	1929 Tons
Edible fats	13,246	13,615
Edible oils (not olive oil)	4,834	5,825
Technical oils and fats	18,156	18,680
	36,236	38,120
Cakes	34,040	31,530

The participation of home production in home consumption, therefore, shows a decrease of 3 per cent., compared with 1928. The occupation of the Swiss oil mills is still in a very unfavorable proportion to their capacity. The cost of living index for 1929 has decreased to 161 from 165 in 1928. This was, however, without effect on the wages. The Swiss manufacturers, owing to these conditions, are now trying to rationalize the production by concentration of the mills, closing down the less important plants.

It is said that the neutralization of excess alkali in boiled soaps with sulforicinoleic acid produces soap of superior quality, without a tendency to turn rancid easily, of increased lathering power and not subject to change of color under storage conditions. The sulforicinoleic acid can be easily mixed with the soap when boiling is completed, at a temperature above 60°C., the quantity of acid added being determined by assay of the amount of excess alkali in the batch.—*Bulletin des Matieres Grasses.*

Fat and Oil Data for Third Quarter 1930

Production, Consumption, Exports and Imports with Factory and Warehouse Stocks September 30, 1930

WASHINGTON, D. C., November 5, 1930.—The Department of Commerce announces that the factory production of fats and oils (exclusive of refined oil and derivatives) during the three-month period ended September 30, 1930, was as follows: Vegetable oils, 482,623,853 pounds; fish oils, 50,693,223 pounds; animal fats, 461,647,143 pounds; and greases, 92,030,752 pounds; a total of 1,086,994,971 pounds. Of the several kinds of fats and oils covered by this inquiry, the greatest production, 339,409,907 pounds appears for lard. Next in order is cottonseed oil with 238,750,677 pounds; tallow with 121,218,486 pounds; linseed oil with 108,236,266 pounds; coconut oil with 85,068,486 pounds; and corn oil with 28,776,328 pounds.

The production of refined oils during the period was as follows: Cottonseed, 158,167,124 pounds, coconut, 69,312,892 pounds; peanut 2,330,798 pounds, corn, 23,252,550 pounds; soya-bean, 1,817,939 pounds; and palm-kernel, 3,117,078 pounds. The quantity of crude oil used in the production of each of these refined oils is included in the figures of crude consumed.

The data for the factory production, factory consumption, imports, exports and factory and warehouse stocks of fats and oils and for the raw materials used in the production of vegetable oils for the three-month period appear in the following statement:

PRODUCTION, CONSUMPTION, AND STOCKS OF FATS AND OILS

(In some cases, where products were made by a continuous process, the intermediate products were not reported.)

KIND	Factory operations for the quarter ended Sept. 30, 1930 Production (pounds)	Consumption (pounds)	Factory and Ware'se stocks Sept. 30, 1930 (pounds)
VEGETABLE OILS: [1]			
Cottonseed, crude	238,750,677	171,982,423	79,280,326
Cottonseed, refined	158,167,124	323,521,464	174,207,919
Peanut, virgin and crude	2,750,535	2,751,189	11,800,892
Peanut, refined	2,330,798	2,549,508	1,938,400
Coconut, or copra, crude	85,068,486	150,752,555	139,432,835
Coconut, or copra, refined	69,312,892	76,571,959	18,029,276
Corn, crude	28,776,328	29,101,988	9,533,605
Corn, refined	23,252,550	2,559,602	10,708,390
Soya-bean, crude	1,220,439	4,183,240	10,067,298
Soya-bean, refined	1,817,939	2,169,746	2,743,574
Olive, edible	—	909,679	4,820,645
Olive, inedible	—	1,353,153	1,929,164
Sulphur oil, or olive foots	—	9,966,795	23,594,316
Palm-kernel, crude	—	12,120,696	14,531,442
Palm-kernel, refined	3,117,078	2,643,064	1,336,283
Rapeseed	—	3,054,279	5,541,228
Linseed	108,236,266	80,359,123	83,944,659
Chinese wood or tung	—	19,070,724	50,740,617
Chinese vegetable tallow	—	1,949,220	4,441,460
Castor	10,046,697	4,343,102	9,557,711
Palm	—	60,343,000	61,593,647
All other	7,774,425	8,551,293	10,200,238
FISH OILS: [1]			
Cod and cod-liver	266,775	3,249,986	13,625,494
Menhaden	14,466,625	3,105,949	13,843,610
Whale	6,277,125	12,676,559	68,773,746
Herring, including sardine	27,724,508	16,274,449	90,991,830
Sperm	541,125	145,598	4,748,566
All other, (including marine animal)	1,417,065	1,468,176	15,317,741

[1] The data of oils produced, consumed, and on hand by fish oil producers and fish canners were collected by the Bureau of Fisheries.

PRODUCTION, CONSUMPTION, AND STOCKS OF FATS AND OILS (Continued)

KIND	Factory operations for the quarter ended Sept. 30, 1930 Production (pounds)	Consumption (pounds)	Factory and Ware'se stocks Sept. 30, 1930 (pounds)
ANIMAL FATS:			
Lard, neutral	4,466,658	3,368,884	2,397,020
Lard, other edible	334,943,249	7,723,750	47,220,430
Tallow, edible	10,364,733	8,599,480	3,151,860
Tallow, inedible	110,853,304	126,705,825	135,326,614
Neat's-foot oil	1,019,199	1,160,738	1,465,051
GREASES:			
White	13,370,632	16,148,267	8,959,632
Yellow	23,248,147	8,644,688	10,179,020
Brown	11,990,499	12,719,884	9,736,865
Bone	7,532,385	245,755	3,414,665
Tankage	12,630,040	106,036	5,488,734
Garbage or house	18,593,229	14,071,605	22,694,296
Wool	2,287,589	1,104,445	3,513,934
Recovered	875,512	601,419	3,765,087
All other	1,502,719	1,184,373	1,987,250
OTHER PRODUCTS:			
Lard compounds and other lard substitutes	317,883,353	504,118	21,163,928
Hydrogenated oils	150,553,718	137,240,862	19,905,341
Stearin, vegetable	6,030,781	6,284,121	1,972,491
Stearin, animal, edible	13,295,975	12,656,027	3,532,383
Stearin, animal, inedible	2,406,662	4,894,581	5,718,807
Oleo oil	30,325,504	12,560,031	21,548,787
Lard oil	5,385,638	2,633,545	4,444,671
Tallow oil	1,616,029	2,310,561	1,802,255
Fatty acids	33,739,582	32,994,641	8,331,901
Fatty acids, distilled	10,553,484	7,236,489	3,475,988
Red oil	8,168,315	5,561,656	6,575,436
Stearic acid	6,302,402	2,241,915	5,259,277
Glycerin, crude 80% basis	33,881,376	35,214,015	15,234,884
Glycerin, dynamite	13,193,772	7,127,936	10,902,352
Glycerin, chemically pure	13,473,445	1,966,251	7,830,756
Cottonseed foots, 80% basis	26,392,546	33,570,829	60,124,505
Cottonseed foots, distilled	19,228,523	17,610,752	6,923,863
Other vegetable oil foots	14,586,856	9,908,778	2,299,569
Other vegetable oil foots, distilled	292,810	1,218,875	786,501
Acidulated soap stock	9,937,380	12,219,601	19,084,845
Miscellaneous soap stock	385,014	588,079	323,361

RAW MATERIALS USED IN THE MANUFACTURE OF VEGETABLE OILS

KIND	Tons of 2,000 pounds Consumed July 1 to Sept. 30	On hand Sept. 30	KIND	Tons of 2,000 pounds Consumed July 1 to Sept. 30	On hand Sept. 30
Cottonseed	789,643	695,033	Flaxseed	164,834	94,730
Peanuts, hulled	4,179	527	Castor beans	11,126	6,801
Peanuts, in the hull	67	20	Mustard seed	90	1,828
Copra	67,165	24,502	Soya-beans	4,807	3,489
Coconuts and skins	501	85	Other kinds	8,530	4,754
Corn germs	45,830	345			

IMPORTS OF OIL SEEDS, QUARTER ENDED SEPTEMBER 30, 1930

KIND	Pounds	KIND	Pounds
Cotton seed	71	Poppy seed	652
Castor beans	11,812	Perilla and sesame seed	7,039
Copra	66,686	Soya beans	276
Flaxseed	27,151	Other oil seeds	2,085

IMPORTS OF FOREIGN FATS AND OILS, QUARTER ENDED SEPTEMBER 30, 1930

KIND	Pounds	KIND	Pounds
Animal oils & fats, edible	664,562	Other olive oil, inedible	1,350,587
Whale oil	211,102	Palm oil	84,435,669
Cod oil	3,887,790	Palm-kernel oil	4,837,553
Cod-liver oil	3,684,728	Sesame oil	816
Other fish oils	8,616,285	Vegetable tallow	206,850
Tallow	22,028	Vegetable wax	881,493
Wool grease	775,413	Cornauba wax	1,094,340
Grease and oils, n.e.s. (value)	$51,984	Rape (colza) oil	530,785
Stearins and fatty acids	1,096,867	Linseed oil	22,591
Olive oil, edible	22,027,487	Soya-bean oil	1,999,775
Peanut oil	13,062,529	Perilla oil	878,200
Other edible vegetable oils	5,418,436	Other expressed oils	817,036
Tung oils	37,971,980	Glycerin, crude	3,081,447
Coconut oil	51,283,586	Glycerin, refined	936,930
Sulphur oil or olive foots	15,716,741		

EXPORTS OF FOREIGN FATS AND OILS, QUARTER ENDED SEPTEMBER 30, 1930

KIND	Pounds	KIND	Pounds
Animal fats & oils, edible	—	Coconut oil	68,283
Fish oils	202,066	Palm & palm-kernel oil	202,433
Other animal oils & fats, inedible	76,544	Peanut oil	5,273
Olive oil, edible	94,035	Soya-bean oil	121,920
Tung oil	1,569,687	Other expressed oils & fats	98,367
		Vegetable wax	221,953

EXPORTS OF DOMESTIC FATS AND OILS, QUARTER ENDED SEPTEMBER 30, 1930

KIND	Pounds	KIND	Pounds
Oleo oil	16,125,971	Other animal greases & fats	15,823,950
Oleo stock	2,415,689	Cottonseed oil, crude	392,657
Tallow	1,130,439	Cottonseed oil, refined	2,770,911
Lard	138,373,674	Corn oil	205,861
Lard neutral	2,844,084	Vegetable oil lard compounds	1,540,742
Lard compounds, containing animal fats	467,145	Other edible vegetable oils and fats	942,124
Oleo & Lard stearin	1,262,355	Coconut oil	6,320,184
Neat's-foot oil	340,698	Linseed oil	274,560
Other animal oils, inedible	163,882	Soya-bean oil	1,184,317
Fish oils	113,240	Vegetable soap stock	2,887,193
Grease stearin	720,383	Other expressed oils and fats, inedible	1,011,559
Oleic acid, or red oil	409,223	Glycerin	291,222
Stearic acid	104,255		

Bowling Tournament

(*From Page* 452)

One of the bright features of the meeting was the Harold Teen bowling team, probably the best burlesque ever staged on a bowling alley. Harold, Beezie, Poison, Pop Jenks and even the beautiful Lillums were present, their characterization by members of Swift & Co.'s laboratory staff eliciting great applause.

The winners of the Nuchar Trophy Cup in open competition were the American Maize Product Company Amaizos team and the winners of the American Oil Chemists' Society championship cup, donated by A. Daigger & Company, were the Swift Premium team. There was a very lively competition and the winner was not decided until the last frame had been rolled. The trophy for the high five games went to the Armour Stars and the winners of the Thursday night bowling contest were the Procter & Gamble Ivories. A special prize was given to Harold Teen, impersonated by Mr. H. Hruby of Swift & Company laboratories. The high individual three game prize went to Mr. Freudenberg of Swift & Company and the high individual single game prize went to Mr. Larsen of the Corn Products Refining Company. The special consolation prize went to Mr. Joyce of Haskins Brothers Soap Co., Omaha, Neb.

Notes of the Industry

McKeldin Mayonnaise Head

At the recent convention of the Mayonnaise Products Manufacturers Association, held at Atlantic City, William R. McKeldin, of Atmore & Son, Philadelphia, was elected president of the association, other officers chosen including:—Vice-president, Ellis R. Meaker, of Ivanhoe Foods, Inc.; Secretary, L. Evert Landon, of Nalley's Inc.; Treasurer, Wade E. Utley, of Capital City Products Co. The Executive Committee includes the officers and C. P. McCormick & Co., also W. D. Kennedy of El-Food Corporation. Frank Honicker was re-elected executive manager of the association.

Kellogg Absorbs Ankeny Refining

Spencer Kellogg & Sons have taken over the Ankeny Refining Company plant at Des Moines, Iowa and plan to establish a middle western distributing office at that location. They also plan a campaign to encourage Iowa farmers to raise more flaxseed, in order to enable capacity operation of the Des Moines plant.

Oil Trades Association of New York held their annual business meeting and fall dinner at the Roosevelt Hotel Nov. 12. Following dinner a short business meeting was held. The entertainment feature for the evening was an indoor golf tournament which was billed as far the pee-wee championship of the industry. Three classes participated—lightweight, middleweight and heavyweight—and handsome prizes were distributed to the winner in each division.

Combustion Engineering Corporation, New York, has just issued a 28-page catalog describing its new type E underfeed stoker, which can be used with boilers ranging from 150 to 600 hp. It is said to be mechanically simple and easy to operate, and is recommended for burning either coking or non-coking bituminous coals and for various refuse fuels.

Stocks of crude cottonseed oil on hand in United States Sept. 30, 1930, totaled 79,280,326 lbs., as against 77,215,150 lbs. held on the same day in 1929. Stocks of refined oil were 174,207,919 lbs. on Sept. 30, 1930, as compared with 175,436,569 lbs. on the corresponding day in 1929.

The Commissariat for Trade of the U.S.S.R. has ratified a program calling for the construction of seven margarine factories, to be located in Kharkov, Nizhni Novgorod, Sverdlovsk, Krasnodarsk, Transcaucasia, Tashkent and Stalingrad.

Mitsui & Co., Ltd., importers of oriental products, particularly oils, have leased new quarters in the Empire State Building, New York City, where they plan to concentrate their various departments as soon as the building is ready for occupancy.

Turbo-Mixer Corporation, 250 East 43rd Street, New York City, have issued an attractive booklet describing their mixing and emulsifying equipment and its various applications. Copies of this brochure will be mailed to those interested upon request.

Link-Belt Company, of Philadelphia, Indianapolis and Chicago, are offering a new variable-speed transmission machine of all-metal construction which they designate as the P.I.V. Gear. In this gear a positive chain drive is used for the transmission of the power rather than a belt of the side friction contact type.

Merco-Nordstrom Valve Company of San Francisco, has developed a new type of flanged joint for use in welded pipe lines. The joint is known as the "Merco" Swivel Flange and is said by the makers to possess all the inherent flexibility of the Vanstone type of flange, plus the stength of an ordinary butt welded flange.

Consul General Lee, Lisbon, Portugal, reports that olive oil production for the 1929 season was approximately 60,000,000 liters, a good average output for the country. The yield for the 1927 season, however, was much larger and reached a total of slightly more than 100,000,000 liters. The crop for 1930 is expected to be small, but it is as yet too early to hazard an opinion as to its quality.

R. C. Asbury has become associated with The Edible Oils Company of Los Angeles, as Sales Manager.

Introduce New Alsop Filter

Alsop Engineering Co., New York, is preparing to market a new low-priced filter designed to facilitate speedy cleaning. The makers say that it can be cleaned in two minutes, eliminating the long mussy job heretofore necessary and thus making it more probable that it will be reconditioned as often as necessary. Filter stones and sand batches, commonly used in other filters, are dispensed with in the new Alsop product, the filter medium consisting of two layers of heavy French filter paper wrapped around a screen. The filter connects to any pipe line and the water passes through with very little drop in pressure. Two or more can be connected in parallel for greater capacity. Model #1 has 400 sq. in. filtering area, a capacity of 15 gals. per minute, and will stand pressure of 100 lbs. per sq. in. All parts are of brass or bronze, and two finishes, nickel and chromium plate, are available.

Lever Storage Plant Changes Hands

The storage and barging facilities of Lever Bros. Co., at Edgewater, N. J. are to be turned over to Harbor Tank Storage Co., of New York, and added to that company's extensive facilities for storage of vegetable oils in the State of New Jersey. These include storage space at Weehawken and Gutenberg, N. J., and additional space at Edgewater, originally acquired from Penick & Ford. The Lever plant includes sixteen storage tanks ranging in capacity from 500 tons to 1,200 tons each. In addition to railroad facilities, the plant has docking and barging facilities permitting rapid unloading of ocean-going tankers. It is also completely equipped with Harper scales.

Molasses, cottonseed oil, fish and animal oils will probably be stored at the Edgewater plant in addition to vegetable oils, but the company has been particularly active recently in handling large quantities of peanut oil through this port, the oil being bonded in tanks for shipment to Toronto, Canada. A building formerly occupied by the Lever interests is understood to be included in the Edgewater deal, but whether the properties were turned over to Harbor Tank Storage under a leasing arrangement could not be ascertained.

Deupree New P. & G. President

Richard R. Deupree, for some years vice-president and general manager of Procter & Gamble Co., has been elected president to succeed Col. William Cooper Procter, who becomes the executive head of the company as Chairman of the Board, a position created in July, 1929, but unfilled until now. Col. Procter will continue his active participation in the management of the company. No successor has been chosen for Mr. Deupree as vice-president, but it is assumed that he will continue as general manager.

Col. Procter graduated from Princeton in 1883 and has been connected with the company during the 47 years since then, working up through the factory and succeeding his father as president upon the latter's death in 1907. The profit sharing plan, old age protection, guaranteed employment, employes' conference committee, and other progressive innovations have been instituted under the leadership of Col. Procter.

Mr. Deupree started as a clerk in the treasury department of the firm 25 years ago, and subsequently became salesman, department manager, division sales manager and general sales manager. In 1928, he was made vice-president and general manager of the company, and now becomes president at the age of 45 years, exactly 25 years after first joining the company. He was born in Virginia but spent most of his early life in Covington, Ky., where he was educated. He is a recognized authority on salesmanship and vocational education and has written several works on these subjects.

A qualitative test for sodium thiosulfate in soaps, devised because of the increasing use of that salt in soaps to combat the effects of chlorine in public water supplies, is described as follows: mix 5 grams of the soap to be tested with 10 cc. of quarter-normal caustic solution containing a piece of potassium cyanide the size of a pea, warm on water-bath, rub to a paste and heat for five to ten minutes, producing potassium sulfocyanide. Add dry salt in small quantities to salt out the soap, filter hot, cool, add a few drops of hydrochloric acid and test for potassium sulfocyanide with ferric chloride. The presence of sodium thiosulfate in soap causes high results in the salt determination, but correct results are obtained by first ashing the soap, which destroys the thiosulfate. *Seifensieder-Ztg.* 57,527-8 (1930)

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Shortening in Baking

(*From Page* 461)

role. The suggestion comes from many sides that we are on the verge of a revolutionary change in cake mixing methods. We, as technical representatives of the oil and fat industry, must be alive to the possibilities.

Before leaving the the subject of cake it might be well to state that hydrogenated fats and butter are the two shortenings which have found favor in this field. The hydrogenated products are quite satisfactory because of their bland flavor, their consistency, and their ability to build up a cell structure which gives the desired volume together with good texture. Butter is used principally for the flavor imparted to the finished baked product. The actual shortening power of butter is only eighty percent that of the all-fat products because of its moisture and milk solids content. It is, however, one of the housewife's most important ingredients and is used by the majority of commercial shops producing quality cakes.

Other Bakery Products

NO discussion of bakeshop products would be complete unless the subject of pies was considered. Three-fourths of the desserts served to men in hotels and restaurants is said to be pie. This proportion does not hold true in the case of women as the estimate claims only one-fourth for them. It appears again that the woman is not sold on the baker's products. Pie crusts are made from flour, shortening, water, and salt, with the percentage of shortening varying from thirty to one-hundred percent on the basis of the flour. Shortening is defined in the dictionary as "that which shortens; especially some product as lard or butter which makes pastry crisp." This definition is well illustrated in the case of pie crusts. Here we have a comparatively large amount of fat present which functions primarily as a lubricant. The distribution of the fat largely determines the type of crust. If the shortening is intimately mixed in the dough so that each particle of flour is surrounded by a layer of fat, then we have the mealy type of crust. If, on the other hand, the shortening and flour are mixed very little then the flaky crust results. A combination of the two methods of mixing will produce a crust with properties between the mealy type and the flaky type. Lard, hydrogenated shortenings, and compound shortenings are all used in pie work. Lard is especially satisfactory because it produces a slightly greater degree of "shortness" and in addition leads to a very desirable flavor in the baked crust.

My time will permit only the mention of several other important classes of bakery products in which shortening plays an extremely important part. Crackers made from a yeast-raised dough and containing an appreciable shortening content, owe their characteristic crispiness to the extremely fine film of fat which surrounds the particles of the other solid ingredients. Danish Pastry, a yeast-raised dough containing shortening in the dough and also having a special roll-in shortening usually in the form of margarine worked into the dough in layers, gives us the coffee cakes and butter biscuits. Puff Pastry depends entirely upon shortening rolled in between layers of dough for its lightness and richness. Turnovers, cream slices, cream roll horns, and patty shells are examples of this class of bakery product.

We have now considered practically every important class of bakery product, and I have tried to describe enough of the method of making these products to bring out the part which shortening plays in them. In conclusion, I would call to your attention a very unfortunate situation. We have no generally accepted definite absolute methods which may be used in evaluating a shortening for bakeshop purposes. The indications of a good flour are very plain. The determinations of moisture, protein, ash, and quality of gluten together with a fairly dependable baking test makes the selection of a flour comparatively simple. Microscopic, analytical, and baking tests furnish a quite accurate control of the yeast. A polariscope reading, screen test, and examination for impurities settles the grade of the sugar. The standardization of the malt, diastatic and otherwise, is not difficult. The percentage of sodium chloride furnishes the criterion for salt. An exact analytical result and solubility test can be obtained on the various milk products. But how do we select a shortening with respect to its ability to do certain work in the bakeshop? We determine the usual constants such as melting point, softening point, iodine number, etc. and are apparently satisfied. It is quite possible that the time is not far distant when we will have to develop and accept scientific and standardized methods for the more indefinite properties such as creaming power, emulsification ability, and shortening power.

Scouring compositions may be formed by adding to soaps, abrasives, etc., a mixture of trisodium phosphate with saponon or sodium sesquicarbonate or both. Brit. Pat. No. 326,755.